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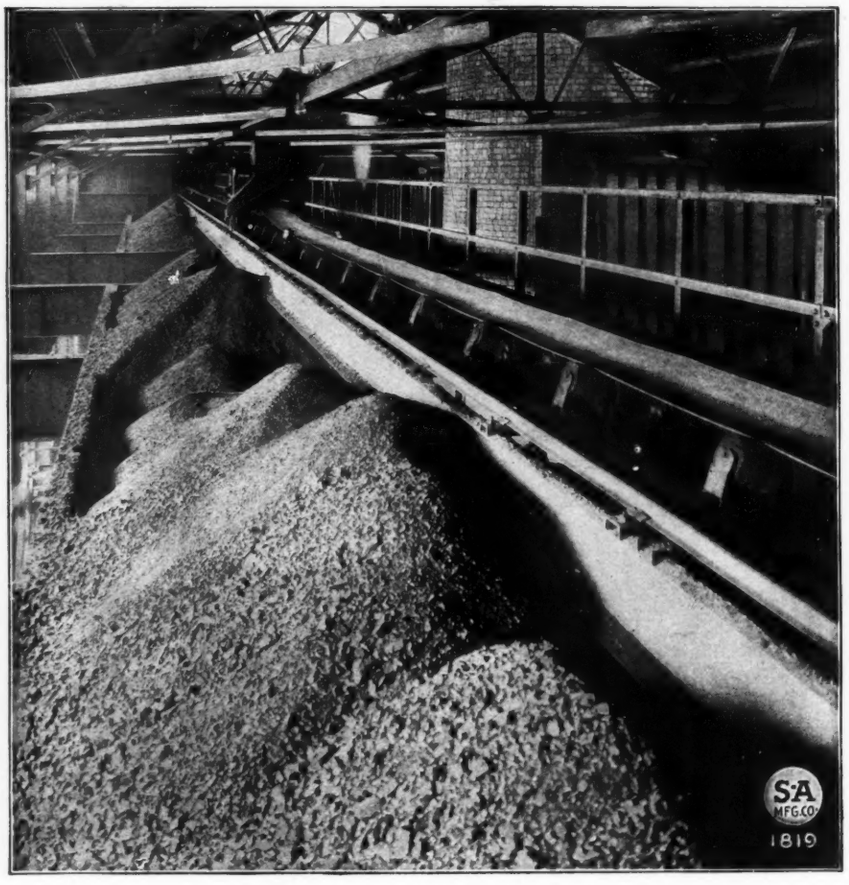

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Present Milling Practice of the Joplin District

By TEMPLE CHAPMAN
Mine Operator, Joplin, Mo.

Ore usually crushed to only ½ inch, but middlings and slimes now receive attention. Some mines have flotation plants. Tendency is toward large plants capable of producing 400 to 600 tons concentrates per week. Power equipments are more efficient and gas or oil engines are being introduced.

THOSE who have been conversant for many years with the Joplin district will probably agree that the modern concentrating plant shows few radical changes from the little mill of 15 years ago, but it does show the effect of steady growth and betterment in every detail of plant construction, milling equipment and power installation.

Power plants formerly consisted of low-pressure boilers and slide-valve engines. Today there are three types of power in common use. The steam plant, with its high-pressure boilers and Corliss engines and condensers, is preferred by some for its combined dependability and economy. In some instances the kind of power is determined by force of circumstances, situation of mine or time of delivery of certain kinds of machinery, but generally, the builder of a new mill is offered a choice of power.

Many new mills are electrically equipped throughout, notably those of the Picher Lead Co. in Oklahoma. Power is obtained at moderate cost (about 1c. per horsepower-hour) from the Empire District Electric Co. This company has several splendid new power stations which include 20,000 hp. in water power and as much more in a modern steam-turbine plant.

With abundance of natural gas the gas engine produces exceedingly cheap power and has become a general favorite. It is used to drive mills, air compressors and pumps. Several companies, notably those controlled by L. C. Church in the Miami camp, use gas engines, and compressed air from gas-engine-driven compressors is carried to distant shafts for hoisting, pumping, etc. The gas-engine plant undoubtedly shows the lowest power costs. Several oil engines of the Fairbanks-Morse Y type are being introduced and their successful operation and low operating cost indicate that they will compete successfully with the gas engine. The selection of an oil engine or gas engine at any given mine will probably be determined by the relative proximity of a gas main or a railway spur on which to set an oil tank car.

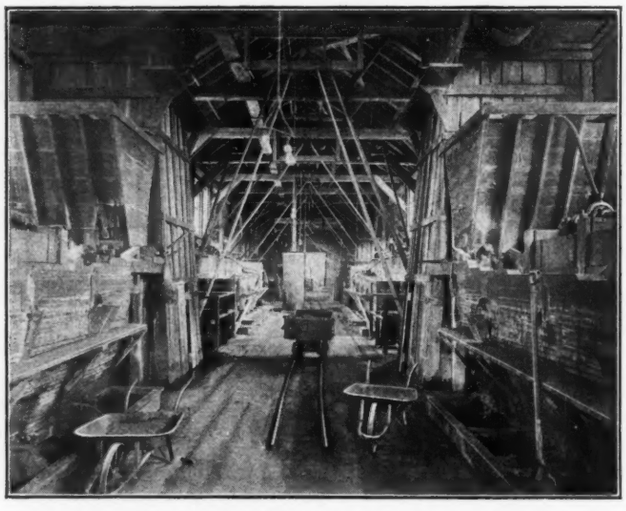
AN UP-TO-DATE MILLING PLANT IN THE JOPLIN DISTRICT, MISSOURI

The Joplin district is fortunate in its ample and varied sources of supply of cheap power—coal, oil, gas and electricity—and all of these cost less than they do in most mining or manufacturing districts. The great growth of the mining industry here and the increasing demand for all kinds of power, with generally mounting war costs, will probably make all kinds of power cost more next winter than they cost today.

The design of a concentrating plant in Joplin is based primarily upon the local need of crushing ore to only

½-in. size and then treating this low-grade, free-milling ore on jigs. The gradual increase in tonnage treated has made the middlings and slimes of more importance than formerly and, consequently, more jigs and more tables have been installed. The newer mills, especially in the Oklahoma part of the district, have two rougher jigs, two cleaner jigs and a sand jig and from 10 to 20 tables of the Wilfley type. Even with this better equipment it is found that much valuable mineral escapes in the fines, and now Dorr thickeners are frequently seen and several of the bigger mines have flotation plants in successful operation. The percentage of recovery varies with the richness of the ore, and, whereas the lean sheet-ground mine with a content of 2% metallic zinc will recover 70%, the richer mines obtain a recovery of 80% in some instances.

A point that has a bearing with local operators is that often shafts may be sunk and a mill of medium capacity built so quickly that it would be in full operation within six months from the date of discovery of the ore, and in six months more would have earned



VIEW OF JIG FLOOR IN A JOPLIN MILL

100% on the investment. Against this desire for a cheap mill and quick profits is the safer and more business-like plan, now in vogue, of thoroughly drilling the orebody with dozens of holes and then building a good, substantial, power-, labor- and ore-saving mill capable of treating a large tonnage and treating it well. One practical result of building the bigger and better mills and the practice of developing sufficient ore to supply the mill from several shafts has been the increase in output from the 30 to 40 tons of zinc concentrates per week per mill to the 400 to 600 tons per week now made by the best mills. Zinc-lead prices are averaging about $90 per ton, and thus a property costing inside of $100,000 to develop and equip may produce concentrates of that value in one month. However, it must be admitted that these bonanza mines are only three or four in number, this illustration of earnings being meant to show that the better mining and milling practice is bringing its just reward in vastly bigger earnings.

The large profits being earned by the mines in the Oklahoma portion of the Joplin district are drawing able mining and mill men from other mining regions. These men are building big mills but are making no radical changes in construction or operation; like the local mill men, they are making only such modifications and improvements as the conditions of each mine may warrant. The friendly personal acquaintance which exists among Joplin mining men, developed to a great extent at the weekly meetings of the mine operators' association, facilitates the rapid dissemination through the whole district of any successful new idea in mine or mill practice, sanitation, etc. It seems reasonable to predict that the great growth in the mineral output of the Joplin district will be a powerful influence toward further improvement in the milling practice.

The Indian Silver Trade

The course of the silver trade of India for three fiscal years ended Mar. 31 is reported as below in ounces:

	1914–15	1915–16	1916–17
Net imports, private	60,017,453	35,629,915	.....
Net exports, private	.....	.....	11,496,760
Net imports, government	.....	.....	104,069,101
Net exports, government	4,251,329	3,697,540	.....
Total net imports	55,766,124	31,932,375	92,572,341

On these figures Messrs. Samuel Montagu & Co., of London, comment as follows: "The figures are of more than ordinary interest, revealing a remarkable reversal in the movements of silver on private account, by which a net influx of over 60,000,000 oz. during the period 1914-15 has been turned into a net export of over 11,000,000 oz., a net difference of over 71,000,000 oz. This reduction is an emphatic rejoinder on the part of the Indian Bazaars to the advance of 50% which has taken place in the price of the metal.

"Further, it will be observed that there was a large net export on government account in the first two periods, while in the last financial year there was a net import of over 104,000,000 oz. on government account. That is to say, the Indian government imported within the last financial year an amount probably well in excess of half the world's production. When it is recalled that this huge import took place mainly in the latter portion of the year 1916-17, its extraordinary character is emphasized."

Temperature Measurement

In an article entitled "Temperature Measurements in Clay Works Practice," appearing in the "Transactions of the Ceramics Society," 1916 (abstracted by the *Journal* of the Society of Chemical Industry), the author recommends the following for measuring temperatures between the ranges given: For 50°–450° C., a mercury thermometer filled with nitrogen under pressure; for 450°–1400° C., a thermocouple of platinum and platinum-rhodium with recorder; above 1400° C., a Féry radiation pyrometer or an optical pyrometer, depending on the brightness of a lamp filament altering with varying resistance.

To control heating where the effect of time, temperature and kiln atmosphere must be indicated, Watkins recorders, Seger cones, Holdcroft thermoscopes, Wedgwood's pyrometer and Buller's rings are used. Seger cones are preferably replaced by a larger wedge made of the same material, the top of the wedge being half the size of the bottom.

Ideal Shop For Sharpening Drill Steel

BY GEORGE H. GILMAN*

Further reduction in drilling costs through improvement in design of the highly perfected rock drill does not promise strides equal to those of the past. Such results are henceforth to be sought at the mine—rather than at the factory—by the application of the principles of modern shop efficiency. An ideal shop, capable of extension and embracing the best features of American practice, is described. The procedure for making new drill steel and for the upkeep of old steel is also outlined.

DURING the last decade the machine drill as applied to the excavation of rock has been in a state of transition from the cumbersome reciprocating engine to the light pneumatic hammer drill, with the result that machine efficiency has been raised to a point hoped for by only the most optimistic miners of 10 years ago. This great change, largely the result of coöperation between the miner and the rock-drill manufacturer, has been consummated, and for the next few years it is reasonable to assume that, with the object of raising the drilling efficiency of the mine or quarry to correspond, the main lines of development will be in the direction of means and methods for taking full advantage of the hammer drill in its present state—instead of mechanical changes applied to the actuating engine.

The rock-drill manufacturer is constantly striving not only to improve the metallurgy of the drill materials in the effort to secure maximum machine effectiveness and efficiency with minimum weight but also to take full advantage of all improvements in manufacturing methods, thus insuring absolute duplication of parts in regard to their chemical and physical properties, interchangeability and, in addition, the field service that he must render users.

The question that confronts the mine operators is: "Can we stand this new type of progress with its incidental increase in the cost of machine equipment unless we likewise enter upon the program of this new development and take full advantage of it?" The answer is obviously in evidence, for no progressive, right-minded man is harboring the thought of reverting back to hand-drilling methods of the good old days, but instead he is striving to develop all the divisions of his mine to conform with present-day facilities.

The rock-drill bit has been justly termed "the business end of rock excavation" and it is therefore the logical starting point in the campaign to improve drilling efficiency. The importance of the size and quality of the drill steel and of the shape and temper of its bit and shank ends has been emphasized. The purpose, therefore, of this paper is to advance suggestions relative to an efficient method and satisfactory means for the production and upkeep of rock-drill steel.

*Chief engineer, Pneumatic Drill and Channeler Department, Sullivan Machinery Co., Claremont, N. H.

Fortunately in the mining industry the old-time practice of maintaining secrecy regarding methods and means of production has been broken down, and today a stronger spirit of coöperation exists among mining men than among many operators of kindred industries. This has resulted in knowledge and resources being pooled for the common good. The suggestions advanced in this paper have been gained only as the result of a personal investigation of a great variety of conditions in different sections of the country, made possible by the coöperation of a great many mining companies.

The selection of the best form of equipment to meet a given set of conditions is dependent upon a number of factors, and the extent to which it is profitable to go, in providing facilities for a drill-steel equipment, is largely governed by the volume of material to be handled, which may be determined by the number of rock-drilling machines employed and the character of the ground. In general, it may be assumed that for a mine or other permanent rock-excavating plant of sufficient capacity to warrant the installation of a mechanical drill-sharpening machine a drill-steel plant equipped with the facilities herein described and possessing the following qualifications is warranted.

PRIMARY REQUIREMENTS OF A SHARPENING PLANT

Primarily a drill-steel plant having one mechanical sharpener should be designed so that the output of the smith and his helper may be doubled by the addition of two men, without any increase in the original shop equipment being necessary, and to provide for possible growth, it should be so constructed that by adding space and certain features of equipment to one end only of the building the capacity may be increased further at slight expense without making any change in the original equipment; that the various operations required to make the drill steel and to reforge and temper used steel are performed with the fewest possible movements and with the least amount of exertion on the part of the operator; and that the character of the work when executed conforms with the established standard for the existing conditions.

To secure these results the building should be of such size that the various machines and their appurtenances may be placed in the most advantageous position. It should be built of materials that are accessible and in conformity with the standard surface equipment of the mine. It should be lighted in such a manner that the piece being worked upon and the operating end of the machine employed are clearly visible to the operator, so that his vision of the parts is not obstructed by shadows; in addition, to meet the requirements of a shop of the size and type herein described, certain features of equipment are recommended in Table I.

In order to obtain maximum efficiency in a drill-steel plant it is essential that the transportation of the drill steel be accomplished expeditiously and with a minimum effort, for, regardless of how suitable the mechanical equipment may be, it is impossible to secure and maintain maximum production from the machines and fur-

naces if a suitable means of transportation conforming to the requirements of the plant is not provided.

To meet the requirements of the type of plant described in this paper it is recommended that the shop, Fig. 1, be equipped with a permanent track and turntable the gage of which corresponds to the standard gage of the mine or quarry tracks, provided such gage does not exceed 36 in. For transporting the drill steel to and from the shaft, or loading platform, a division car of the Copper Queen type, Fig. 2, described in the *Engineering and Mining Journal*, June 24, 1916, will be found to meet the requirements satisfactorily. This car may be equipped with a body detachable from the truck to facilitate the work of transferring the drill steel to the mine skip, cage or wagon without removing the bars from the receptacle, or it may be employed for the purpose intact, and in the case of the mine the whole may be lowered to the different levels where the distribution of the steel may be made in conformity with standard practice. Of the many forms of carriages or trucks employed for the transportation of the drill steel while it is in the transition stage during the process of working, that developed by the Copper Queen Consolidated Mining Co., and described in the article referred to, is perhaps best adapted for a drill-steel plant of this general type.

TABLE I.

EQUIPMENT FOR DRILL-STEEL SHOP

Transportation

106 Ft. of 24-in. gage track (rail 35 lb. per yd.) comprising 36 wood ties 4 x 6 x 36 in.
4 Mine-car turntables—24-in. gage
1 Turn plate (if required)
3 Compartment cars with revolving body (Copper Queen type)
3 Division cars with detachable body (Copper Queen type)

Furnace

1 Forging furnace (oil or gas burner)
1 Tempering furnace (oil or gas burner)
2 Drill-steel supports for furnaces
2 Ventilators with hoods for furnaces
1 Oil storage tank
1-in. pipe with fittings for low-pressure air supply
¼-in. pipe with fittings for fuel supply.
2 Pyrometers, equipped with base metal couples having indicating voltmeter and cabinet
¾-in. electrical-conduit piping (for pyrometers)
2 Pyrene fire extinguishers

Sharpener

1 Drill sharpener with full equipment of dies and dollies including supplementary gaging dies and pneumatic-hammer punch
1¼-in. pipe with fittings for compressed-air supply
1 Storage cabinet for drill-sharpener appurtenances
2 Suspended drill-steel supports (for sharpener and grinder)
1 Floor grinder (direct electric-driven) with two grinding wheels 18 x 3 in.
1 Electric switchboard for motor

Tempering

1 Rotary quenching and tempering machine (Homestake type), with 1-hp. motor
1 Electric switchboard for tempering-machine motor
1 Oil-quenching tank with cyanide receptacle.
1 Ventilator with hood for cyanide receptacle

Racks, Tables and Accessories

1 Inspection and bundling rack with incline, equipped with one gage cabinet
1 Storage rack for drill-steel bar stock
1 Storage rack for finished drill steel
1 Used steel table

Sanitary Equipment

1 Sanitary drinking fountain
4 Steel double-deck lockers.
2 Wash basins
1 Sanitary towel rack.
1 Urinal
1 Flush bowl
1 Emergency cabinet

General Equipment

1 Work bench equipped with 5-in. machinist's vise
1 Desk with drawers and hinged top
1 300-lb. anvil
1 Set of hand chisels and sledges
2 500-watt Mazda lamps with reflectors
1 60-watt Mazda lamp with reflector
Water piping
Compressed-air piping and hose equipped with Davies blowgun
Waste piping
Oil piping
Electric wiring
Concrete floor

The compartment car, Fig. 3, consists of a truck having the wheel gage corresponding to the track standard, on which is mounted a revolvable compartment body supported by a ball bearing and equipped with a latch for locking the body with relation to the truck in any desired position. This car is employed for transporting the steel from the sorting table and the oil-quenching tank to the heating forges. In it the various lengths of steel are segregated and by virtue of the revolvable body the insertion and removal of the drill steel is accomplished advantageously. Subsequent to the final heating of the bit the steel is transported mechanically by the tempering machine and deposited upon the inspection rack, Fig. 4, whence it is loaded into the division car and transported from the shop.

The four turntables with which the track system is equipped provide means for the cars to be bypassed at any point except the dead end and, by having the main line extend through the building longitudinally, a convenient means is provided whereby the track system of the shop may be in intercommunication with the yard system and the other departments of the mine plant. At the outside of the building adjacent to the main entry a turn plate is provided, composed of boiler plate ⅜ in. thick, to facilitate the switching of the cars to and from a series of tracks from the yard system which may terminate at the outer edge of the plate.

Heating Furnaces for Forging and Tempering

The heating of rock-drill steel preparatory to forging and tempering the bit and shank end is an engineering problem and it must be considered as such if maximum efficiency is to be obtained. The success of the furnaces employed depends upon the type and the method adopted for their operation. In order to perform their function in the most uniform and economical manner they must be constructed according to scientific principles in which the following considerations serve as a basis:

1. Size and shape of the drill steel to be treated.
2. Quantity of drill steel to be treated during a specified time.
3. Temperature required to insure proper results, and means for its regulation and maintenance.
4. Local conditions.
5. Most convenient and economical cycle of operations.

Gas as fuel is recommended where it is available at low cost but as oil is of necessity adopted in a large majority of mining camps in this country, the employment of either as a heating agent will apply to the type of furnace described herein. For present-day requirements of the average mine or quarry, situated in many instances in remote and inaccessible places, where the carrying of a varied stock of refractory material is not only difficult but also expensive, simplicity of furnace design with special regard to repairs should be considered primarily. With this in view the refractory material used in the construction of a furnace should be composed solely of standard-size firebrick, procurable in almost every local market, and it should be assembled in such a manner as to enable any blacksmith to repair or rebuild it with ease and success.

The heating chamber of the furnace should preferably be of such size and shape, and its burner so posi-

tioned, that the steel is heated by reflection or radiation rather than by direct impingement of the flame on the metal. This will prevent blistering and reduce the formation of excessive scale which is likely to result if the flame is caused to play directly on the metal. The heating chamber should be of such size as to absorb economically the heat of the products of combustion.

A certain amount of flexibility that may be taken advantage of by an untrained operator is desirable, inasmuch as the character of the flame required for heating, to the best advantage, standard types of $\frac{7}{8}$-in. hexagon and $1\frac{1}{4}$-in. round hollow steel will vary with the size of the bit and the shape of the drill shank; and, in the case of the lugs or collars on the shank, will require only the heating of that portion to be upset, without affecting the extreme end of the bar, and thus obviate the necessity of cooling the tip before it is inserted in the dies of the drill sharpener. This flexibility may be secured by employing a burner of such construction that a perfectly round or fan-shaped flame is produced at will by the operator by merely adjusting a thumbscrew. Another desirable feature of such a furnace is to have at the end of the cnamber from which the drill steel is withdrawn a maximum heat zone of constant and uniform temperature, from which the temperature is lowered gradually but to an appreciable degree toward the end opposite where the steel is inserted. This will give the steel time to absorb the heat gradually, and will secure uniformity in the opening of the grain as the steel bars are handled in rotation.

It has been determined by experiment that the time period of 4 min. is desirable for heating the larger sizes of bits formed on the $1\frac{1}{4}$-in. round hollow drill steel and in order to insure an output of one steel every 30 sec. from the forging furnace, the mouth or opening for the insertion of the steel should be 2 ft. 6 in. long with a height of $3\frac{1}{2}$ in. Pyrometer readings should be taken from that part of the furnace directly adjacent the drill steel at the point of withdrawal.

If desirable, the low-pressure air supply for the furnace may be secured from the main high-pressure air supply of the mine or quarry, in which case a pressure-reducing valve should be used to secure a terminal pressure of approximately 15 lb. below the lowest fluctuation of the main-line pressure. This reducing valve may be placed in the wall adjacent to the point at which air enters the building from which a supplementary low-pressure air duct is provided for the two furnaces, as shown in Fig. 1A.

To obtain the best results from any type of burner in point of economy and ease of operation it is of prime importance to have both the oil and the atomizing agent as constant and steady as possible. After passing through the pressure-reducing valve it is desirable to have the air for the furnace supply pass through a pipe mounted directly over and running lengthwise with the mouth of the furnace. In this pipe provision may be made by drilling a series of small holes directed downward—for the escape of a part of the air which will serve the double function of preventing the waste gases from flowing out in the face of the operator—and assisting in keeping cool that section of the drill-steel bar that projects from the furnace. After passing along the mouth of the furnace the air should preferably make two three-quarter circuits on the top of the brickwork, but inside of the cast-iron casing, for preheating it, preparatory to admission to the burner. Fig. 5 shows a furnace constructed along these lines.

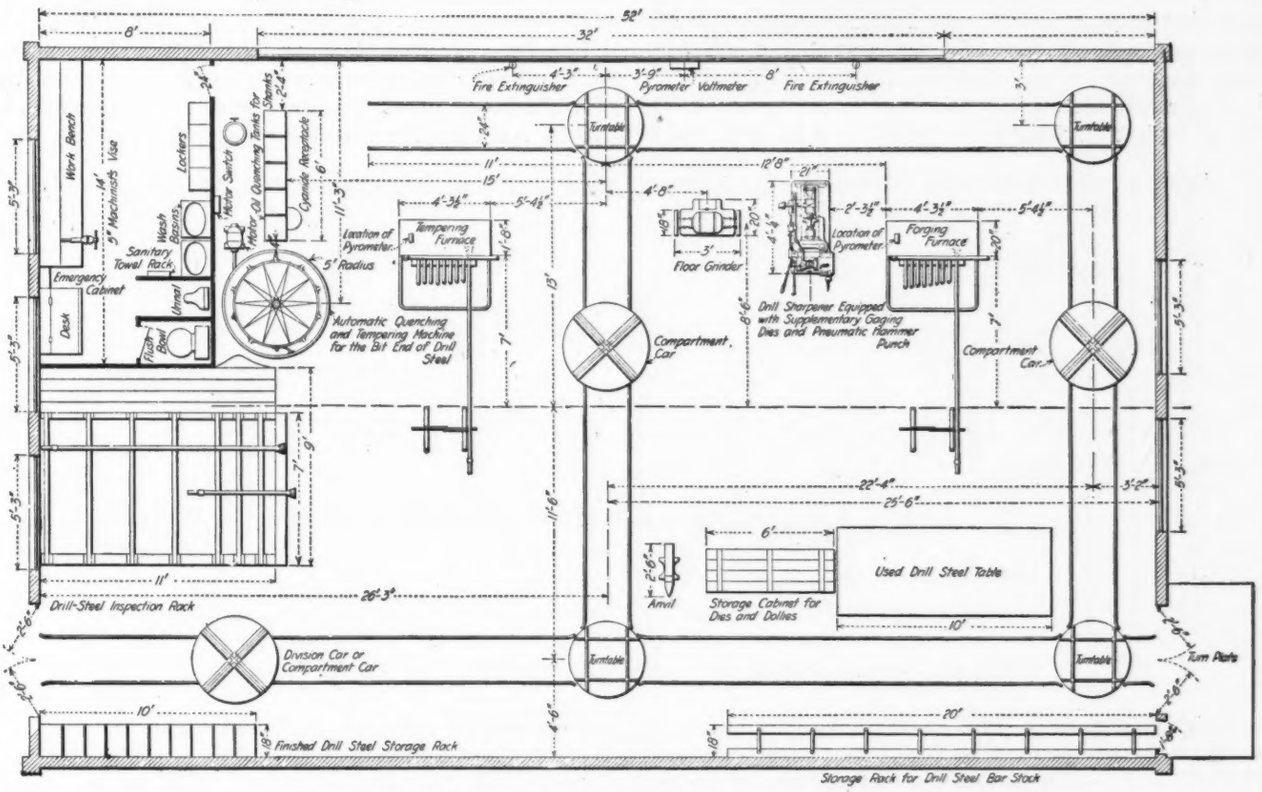


FIG. 1. FLOOR PLAN OF IDEAL SHOP FOR SHARPENING STEEL

The drill-steel support shown by Fig. 6 provides a simple, rugged and convenient means for supporting the drill steel during the heating operation. Constructed from flat bars of ½ x 2-in. low-carbon machinery steel or wrought iron it may be made by any blacksmith with an ordinary forge-shop equipment.

The Drill Steel Sharpening Machine

By far the most essential requisite of a drill-steel plant is the machine for forging the bit and shank ends of the drill steel. There are few apparently unimportant items of expense that are likely to assume more serious proportions than the wasting of time by men, caused by failure of the machine to produce the finished product in a condition that meets the requirements of the plant. Correct sizing and shaping of rock-drill steel are equally as essential to efficient mining as the efficiency of the drill itself and, therefore, a machine sharpener that conforms with these requirements and in addition produces the bit and shank end in the best possible condition to be tempered should be adopted.

It is a well-known fact that the "standing-up" quality of a piece of steel when forged to a finished shape by hammering, under light rapid percussive blows, is superior to that secured by any other known method. For this reason a drill sharpening machine answering this requirement is desirable. It should be equipped with means supplementary to the main forging dies for gaging the various sizes of bits mechanically, within close limits, and for punching out the axial hole of the steel at both the bit and shank ends. In construction it should be strong enough to withstand without undue wear or breakage the severe service to which it is subjected and all control levers should be interlocked in order to insure the various operations being performed in proper sequence and with a minimum of danger both with respect to the operator and the piece being worked upon.

For the storage of dies, dollies and other drill-sharpener appurtenances the cabinet shown by Fig. 7 will answer the requirements satisfactorily. Placed at a convenient distance with respect to the drill sharpener and between the used-drill-steel table and the anvil, the heights of which correspond, it serves also as a support for the drill-steel bar stock when being cut to proper length preparatory to forging and also as a straightening bed for bent steel by virtue of the three bars of iron rail with which the top of the cabinet is equipped.

A floor grinder, preferably direct-motor-driven and equipped with two 18 x 3-in. corundum or carborundum wheels, should be placed at the left of the drill sharpener where it will be readily accessible to the operator. The function of the wheel adjacent to the sharpener is that of squaring off the ends and redressing drill shanks, while the wheel opposite, which should be preferably of somewhat finer grain, may be employed for refacing dies and dollies and other general grinding. The speed of the grinder when driven by a 5-hp. motor should be 1150 r.p.m. When grinding drill shanks the steel may be supported by a hook suspended from an overhead trolley having its track mounted in alignment with the grinder wheel and at right angles to the grinder shaft. Such a support is described in the *Journal* of Feb. 10, 1917, by James E. O'Rourke[1].

The heat treatment of rock-drill steel is a factor which determines success, as applied to the excavation of rock, to as great a degree as the heat treatment that is accorded the various parts that enter into the construction of the drill itself and, when the requirements of the work are once fixed, it is of the utmost importance that the temper of each piece be the same. This result may only be secured by reducing to a minimum the personal equation. While many expert steel workers are able to determine by experiment the required hardening heat and the cooling method for steel of various chemical compositions, the human potential is influenced by the physical condition of the man, and in order to carry the operation of tempering beyond the point of human influence, machinery must be employed as a substitute.

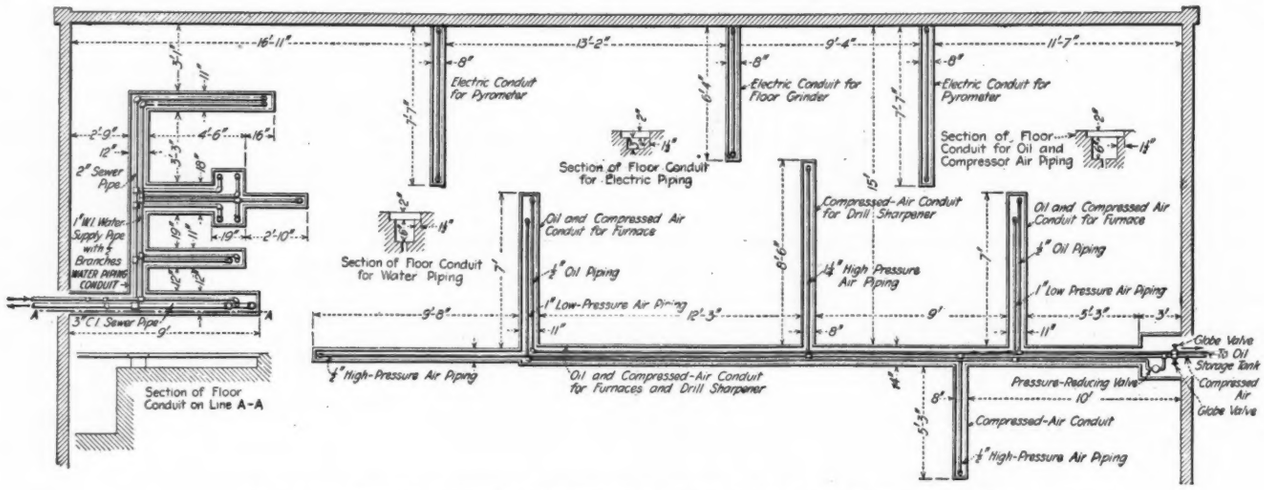
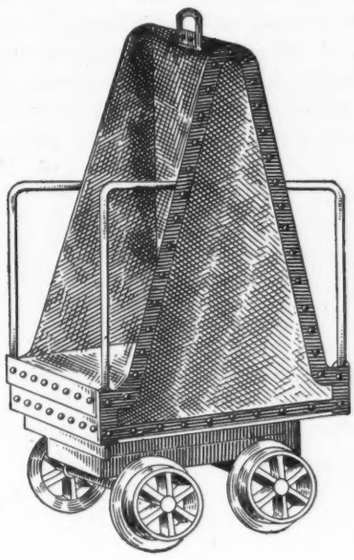

Electric Conduit for Pyrometer
Electric Conduit for Floor Grinder
Electric Conduit for Pyrometer
Section of Floor Conduit for Electric Piping
Section of Floor Conduit for Oil and Compressor Air Piping
Section of Floor Conduit for Water Piping
Oil and Compressed Air Conduit for Furnace
Compressed-Air Conduit for Drill Sharpener
Oil and Compressed Air Conduit for Furnace
2" Sewer Pipe
1" WI Water Supply Pipe with ¼ Branches
WATER PIPING CONDUIT
3" C.I. Sewer Pipe
Section of Floor Conduit on Line A-A
½" Oil Piping
1" Low-Pressure Air Piping
¼" High Pressure Air Piping
½" Oil Piping
1" Low Pressure Air Piping
¼" High-Pressure Air Piping
Oil and Compressed-Air Conduit for Furnaces and Drill Sharpener
Globe Valve
To Oil Storage Tank
Compressed Air
Globe Valve
Pressure-Reducing Valve
Compressed-Air Conduit
¼" High-Pressure Air Piping

FIG. 1A. PIPING SYSTEM UNDER FLOOR OF DRILL SHARPENING SHOP

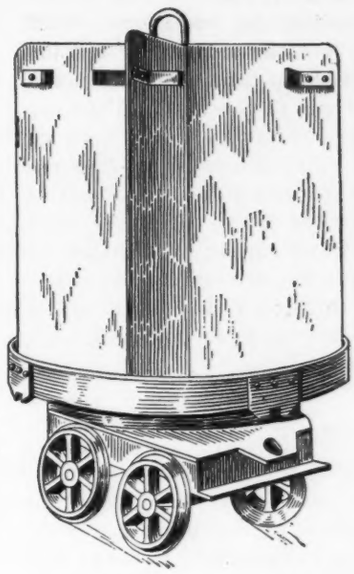
For the requirements of a drill-steel plant of the size and type described herein, the tempering machine for the bit end of the steel as developed[2] by the Homestake Mining Co. is perhaps the most satisfactory. This machine, preferably motor driven as shown in the plan view, Fig. 1, is placed at a point adjacent both to the tempering furnace and to the main water supply, and

[1] "Operating a Drill Sharpening Shop," by James E. O'Rourke, "Eng. and Min. Journ.," Feb. 10, 1917.

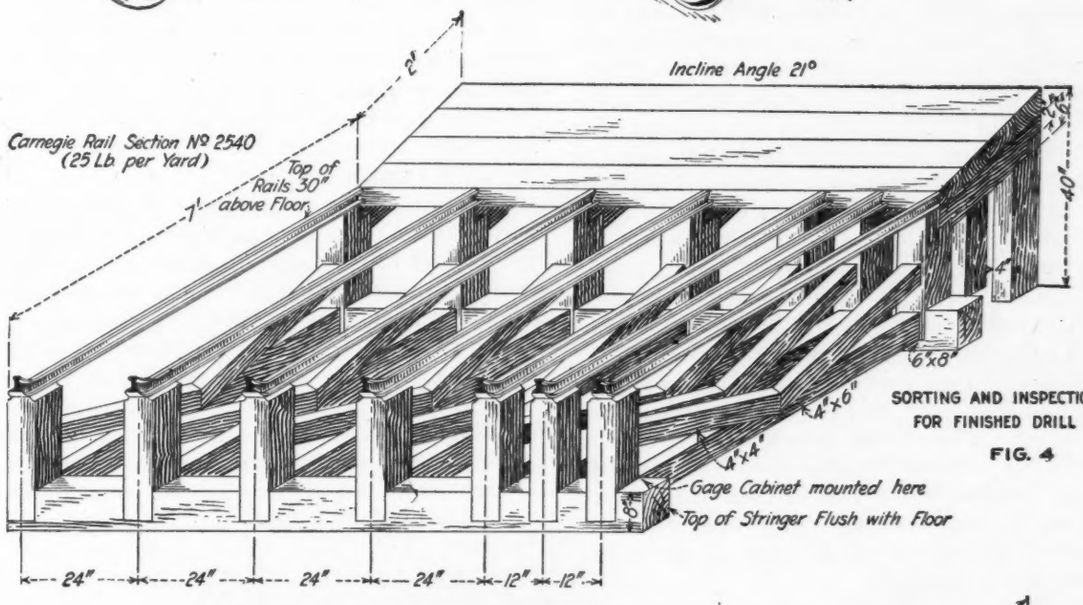
[2] "Eng. and Min. Journ.," May 12, 1917.



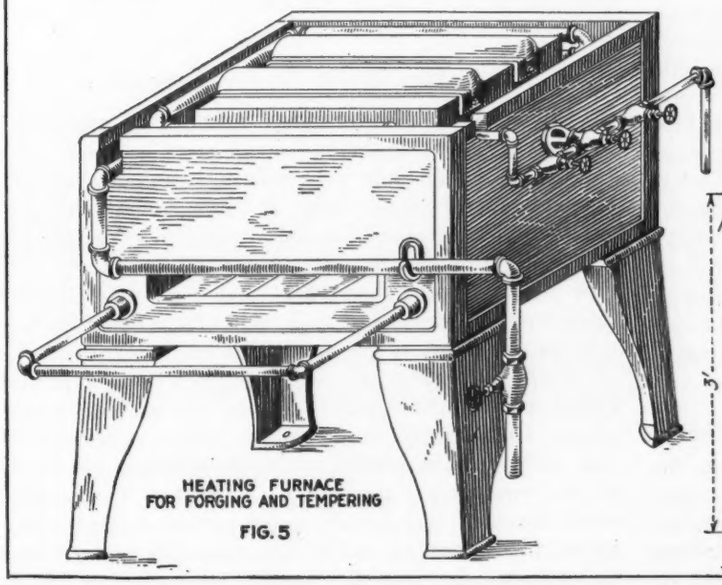
DIVISION CAR
FIG. 2



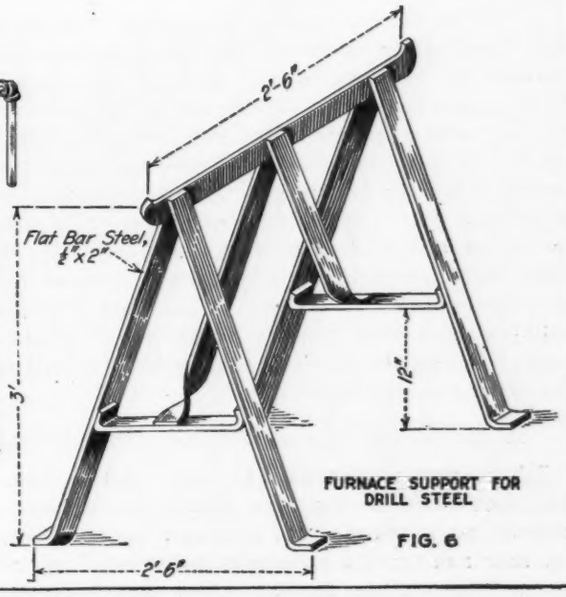
COMPARTMENT CAR WITH REVOLVABLE BODY
FIG. 3



SORTING AND INSPECTION RACK FOR FINISHED DRILL STEEL
FIG. 4



HEATING FURNACE FOR FORGING AND TEMPERING
FIG. 5



FURNACE SUPPORT FOR DRILL STEEL
FIG. 6

FIGS. 2 TO 6. ACCESSORY EQUIPMENT FOR IDEAL SHOP FOR SHARPENING DRILL STEEL

is so positioned and equipped with guide hangers that the drill steel, when discharged, falls on the inspection rack where it is accessible for inspection. Back of the tempering machine and adjacent to the heating furnace, where it is accessible to the compartment car when placed near the dead end of the track, is the oil-quenching compartment tank shown in Fig. 8 with its supplementary receptacle for cyanide of potassium. This is employed only for tempering the shank end of the bar in the manner described in my article on "Drill Steel and Drill Bits for Metal Mining," published in the *Engineering and Mining Journal* of May 12, 1917. Both tanks are preferably of steel construction and it is recommended that the inner surfaces be coated with an acid-resisting paint as insurance against oxidation.

Storage Racks and Tables

The used-drill-steel table of the type shown by Fig. 9, on which the used drill steel is deposited from the division car, provides a means for facilitating preliminary inspection. If bent or plugged steel is found, the defects are corrected by using the straightening and cleaning facilities, provided on the top of the drill-sharpener cabinet before the steel is loaded into the compartment car preparatory to heating for forging. In the case of broken steel it is cut to length, piled on the floor at some convenient point until a sufficient quantity has accumulated, when, as regards the necessary forging and tempering operations, it is treated as new steel.

For the storage of finished drill steel a rack, shown by Fig. 10, and placed adjacent to the inspection sorting rack, is recommended. This rack should have compartments preferably made of boiler plate, and should be equipped with a base plank of hard wood to protect the floor and to insure the bit ends of the finished steel against chipping. The various compartments serve to accommodate the different lengths and types of drill steel that may be employed. From its position, as shown by Fig. 1, the finished drill steel may, when required, be transported directly to the division car or to the inspection rack for bundling.

A convenient and inexpensive storage rack for drill-steel bar stock is shown by Fig. 11. This may be constructed by any experienced mechanic or blacksmith from standard materials usually sold by hardware stores in every mine and quarry district. Preferably the base timbers are embedded in the concrete floor while the top stringers may be fastened by any means convenient to the girders of the building. From its position opposite the supplementary doorway in the east end of the building (Fig. 1), where it is conveniently situated for receiving the material, the various sections and sizes of drill-steel bar stock may be readily removed and carried to the anvil and straightening bed for cutting to the desired length for forging.

Inspection Rack for Finished Drill Steel

For inspecting the finished drill steel a rack, the details of which are shown by Fig. 4, will be found convenient, as it permits the inspector to walk between the rails and thereby facilitates the work of inspecting and sorting. After inspection the steel bars may be easily rolled to the edge near the track, from which they can be loaded directly into the division car, or transferred to the finished drill-steel rack as desired. As shown by the general plan, the inspector's gage cabinet, Fig. 12, is mounted on the timbers at the operating end of the rack where it is conveniently accessible. In this cabinet, which is equipped with sliding doors, wood pins and shelves, means are provided for storing the necessary gages and measuring devices.

Sanitary Toilet-Room Facilities

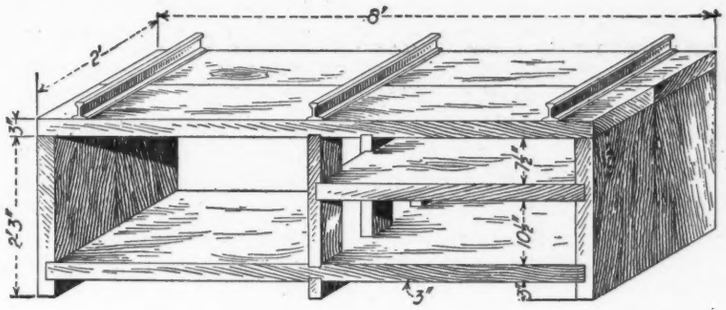
Applications of the principles of scientific management have demonstrated the importance of providing sanitary facilities, not only as applied to the surface equipment of the mine but to the underground workings. The wide-awake mine manager is striving to narrow the gulf between himself and his workmen by the giving of happiness and the meting out of justice. Health is the foundation of happiness and it is on this theory that industrial manufacturers have for years recognized the economic advantage of substituting clean, light and well ventilated buildings for the unsanitary shops of the past.

A workman who finds pleasure in his work and his environment usually prides himself in producing a satisfactory product. It is on this theory that toilet facilities are recommended as applied to the mine drill-steel shop. The toilet room illustrated on the plan view is in a corner of the building where the space it occupies is not required for other equipment. It is adjacent to that part of the plant where running water is required for the tempering machine so that the branch length of water piping necessary for the flush bowl, urinal and wash basin is reduced to a minimum. These accessories are placed near the inner wall of the toilet room in preference to the outer wall of the building, to minimize the liability of freezing in cold weather. Furthermore, this arrangement permits the placing of the work bench and the foreman's desk, Fig. 13, where the light from outside may be used to the best advantage. Double-deck lockers, one for each workman, an emergency Red Cross cabinet and a sanitary paper-towel rack, in addition to the sanitary drinking fountain, placed in the main shop adjacent to the toilet room, complete the sanitary equipment.

Compressed-Air Supply in Shop

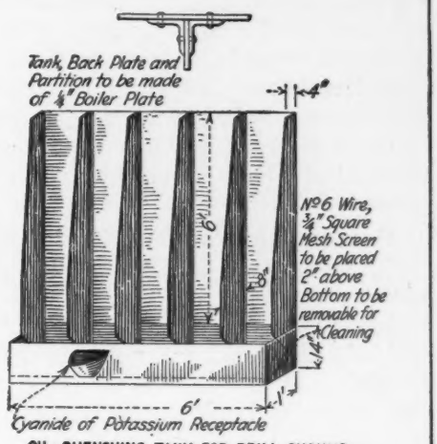
Compressed air is necessarily used for operating the drill sharpener and, in the absence of a blower, for operating the furnaces. Another desirable use for the air is to facilitate the work of inspecting the hole in hollow drill steel and to assist in cleaning out plugged steel. For this latter purpose the air is conducted by a pipe line to a point adjacent to both the used-drill-steel table and the inspection rack, Fig. 1A, from which it may be conducted to the work by a 12-ft. length of $\frac{7}{16}$-in. plain, pneumatic, air hose equipped with a Davies blowgun[3] (the invention of Thomas Davies, head blacksmith of the United Verde Copper Co.). In the use of this feature the operator, by merely pressing the nozzle of the gun against the mouth of the hole in the drill steel, causes a valve to be automatically opened which allows a blast of air under line pressure to be blown through the opening. The act of removing the nozzle

[3] "Drill Sharpening Methods at the United Verde Mine, Arizona," by Frank Richards, "Eng. News," Feb. 1, 1917.



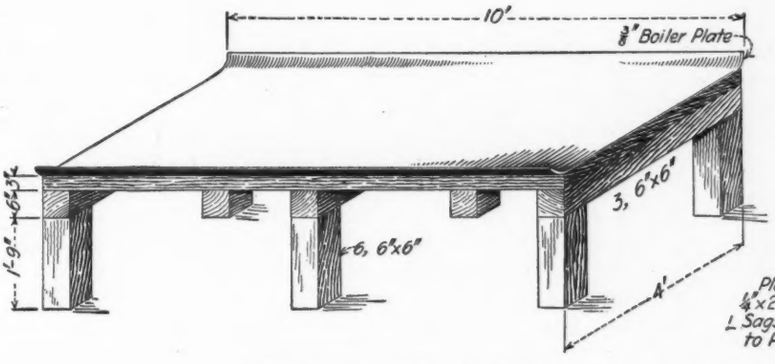
STORAGE CABINET FOR DRILL SHARPENER APPURTENANCES

FIG. 7


Tank, Back Plate and Partition to be made of ¼" Boiler Plate
4"
No 6 Wire, ¾" Square Mesh Screen to be placed 2" above Bottom to be removable for Cleaning
6'
8"
1'4"
1'
6'
Cyanide of Potassium Receptacle

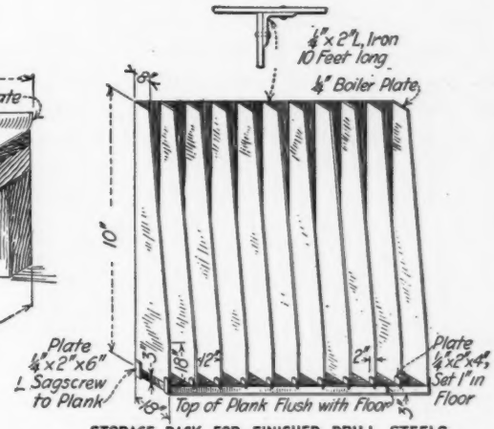
OIL-QUENCHING TANK FOR DRILL SHANKS

FIG. 8



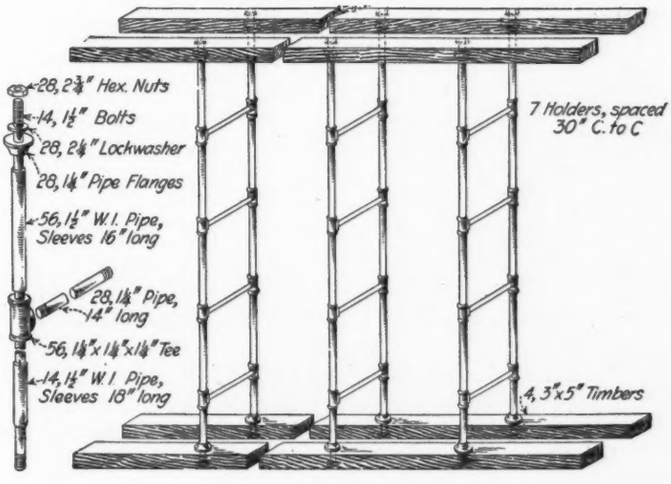
USED DRILL STEEL TABLE

FIG. 9



STORAGE RACK FOR FINISHED DRILL STEELS

FIG. 10


28, 2¾" Hex. Nuts
14, 1½" Bolts
28, 2½" Lockwasher
28, 1¼" Pipe Flanges
56, 1½" W.I. Pipe, Sleeves 16" long
28, 1¼" Pipe, 14" long
56, 1¼"x1¼"x1¼" Tee
14, 1½" W.I. Pipe, Sleeves 18" long
7 Holders, spaced 30" C. to C
4, 3"x5" Timbers

STORAGE RACK FOR DRILL-STEEL BAR STOCK

FIG. 11

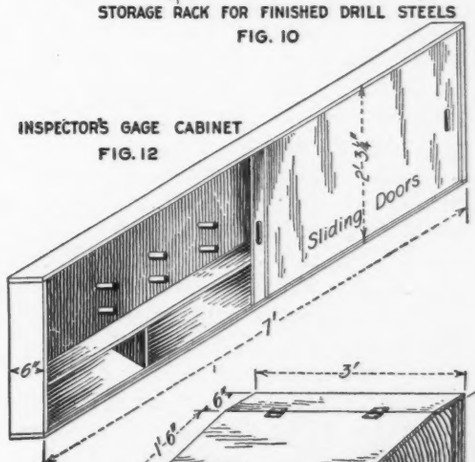
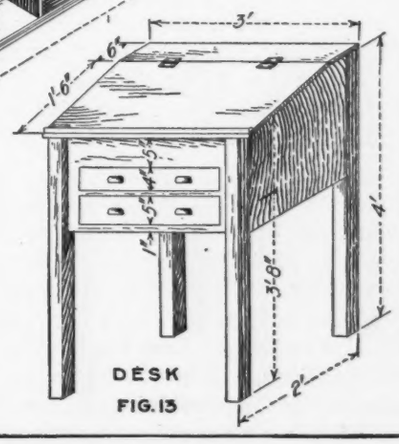


FIG. 12



DESK

FIG. 13

FIGS. 7 TO 13. ACCESSORY EQUIPMENT FOR IDEAL SHOP FOR SHARPENING STEEL

of the gun from the end of the steel causes the push throttle to be closed automatically. If preferable for the final inspection of the drill steel, water under pressure instead of compressed air may be employed at the inspection rack, in which case the nozzle of the gun is preferably equipped with a backing flange and a soft rubber gasket, which, when compressed against the end of the steel shank, provides a seal and prevents undue leakage. In Fig. 1A subfloor conduits for the compressed-air piping are shown.

Heating, Lighting and Ventilating the Shop

For heating the building in cold weather a four-coil radiator composed of 2-in. wrought pipe, extending from the west entrance and along the west, north and east walls to the east entrance, will answer requirements satisfactorily except for extremely cold climates in which additional coils may be required. Live or exhaust steam may be employed for the purpose but in either case the precaution of providing suitable drains in the system should be taken to insure against freezing.

The lighting and ventilating facilities of the plant are items that should receive due consideration. In Fig. 1 is shown the location and size of the windows recommended for a plant of the type herein described, on the assumption that the building is placed on a line running east and west and the normal position of the operator faces in a northerly direction to avoid the direct rays of the sun falling upon the front side of the furnace and drill sharpener. A steel sash pivoted at the sides is recommended for the windows and may be operated by means of a rocker shaft procurable from the manufacturers of such apparatus. The windows at the ends of the building may, if desired, be composed of four rows of sash, while the sill of the window in the north side of the building should preferably be mounted at least 7 ft. above the floor and composed of eight panels, in a single row, operated by one gear from the rocker shaft. From such construction, a fair degree of natural light and ventilation is secured. For exhausting the gases from the heating furnaces, suspended hoods, adjustable vertically and equipped with telescope flues extending through the roof of the building, should be provided.

Artificial light sufficient to meet the requirements of the main shop may be secured from two 500-watt Mazda lamps with reflectors, supported from the roof on a center line through the building, one of which should be placed at a point slightly to the left of the drill sharpener, while the other should be slightly to the left of the tempering furnace. One 60-watt Mazda lamp suspended by an extension cord directly over the desk in the toilet room will be found ample for the purpose.

Floor Preferably of Concrete

The floor of the shop should preferably be of concrete, poured after the wood base plates of the various fixtures, including ties for the track system, are placed in position. Conduits for all subfloor piping of such size and shape that ample clearance for the pipe and its fittings, with provision for a covering with wood plank, should be provided (see Fig. 1A). The advantage of this construction is obvious as it provides a means for making the system readily accessible in case the pipe should become plugged or broken through accident. If desirable, a wood floor pad made of 2-in. planks may be embedded in the concrete at various points repeatedly covered by the operators. This provides for a certain amount of resiliency which will be found advantageous.

Increasing Capacity of Shop

By adding 24 ft. to the east end of the building and the installation of an extra drill-sharpening machine, heating furnace, grinder, cabinet for drill sharpener appurtenances, and track with one turntable, the output of the plant may again be increased approximately 50% by the addition of two operators. The ultimate capacity of the plant will then correspond to the requirements of all but a few of the largest users of rock drills in this country having a central drill-steel plant.

Procedure to Adopt for Making New Steel

Remove the drill-steel bar from the bar-stock rack and place it on the top of the drill-sharpener cabinet with the end of the bar to be cut off supported by the anvil. Nick the bar at the desired point, using a chisel and sledge and break to length, leaving temporarily the pieces to be worked upon on the drill-steel table. When a sufficient quantity of pieces are available, place in the heating furnace, handling the steel in rotation by inserting a new piece when one is removed, after having attained the required degree of heat for forging. Form the shank in the drill sharpener, using the grinder and pneumatic punch, if necessary, after which place in compartment car, shank end down. When the forging operation is completed, turn the compartment car one-half way around, place the shank end of the bar in the tempering furnace, handling the steel in rotation as before and, when the shank has been heated to the required degree for tempering, remove from the furnace, dip the tip end in the cyanide of potassium and then plunge the heated end in the oil vat, allowing it to remain in the oil until cool. Now remove the steel from the oil vat and place it in the compartment car shank-end down. Run the car to its position adjacent to the forging furnace, remove the bar and insert the blank end in the furnace, handling it in rotation as before. Form the bit to the required gage diameter for the particular length of the piece being worked, after which place it in the compartment car at the left of the furnace. When the forging operation of the bit end is completed, turn the compartment car halfway around, place the steel in the tempering furnace, handling it in rotation as before and, when the required degree of heat is attained, quickly insert it in the bath of the tempering machine. After the steel has reached the inspection rack, inspect each piece carefully, place the pieces that pass inspection in the finished-drill-steel storage rack or in the division car and rework the defective pieces if any are found.

Procedure in Reworking Used Drill Steel

After the used drill steel is transported by means of the division car from the shaft, or receiving platform outside of the building, it is deposited on the used-drill-steel table, where it is subjected to a preliminary inspection. If bent or plugged drill steels are found they are straightened and cleaned out by the use of the anvil in conjunction with the straightening bed

on top of the sharpening-machine cabinet, after which they are sorted and placed in the compartment car. If a shank is found broken to such an extent that reforging and tempering are warranted, the steel is discarded temporarily and placed in position convenient for reforging when a sufficient quantity has accumulated to warrant the operation, in which case the procedure will be the same as that required for shanking new drill steel.

In the case of shanks that merely require regrinding to put them into proper working condition the steels are placed in the compartment car (shank end down), which, after being loaded, is pushed to a point adjacent to the grinder, where such steels are removed and redressed, after which they are placed in the car (bit end down) and the whole is transported to a point adjacent to the forging furnace where the procedure for sharpening the bit is the same as that required for the bit end of new drill steel. After the final inspection they are again bundled, if such be the practice, loaded into the division car and transported to the shaft, or loading platform, for distribution.

If desirable, a lessening of the distance covered by the operator, while removing the steels from the furnace, forging and grinding prior to depositing them in the compartment car, can be made. The grinder, drill sharpener and forging furnace may be grouped more closely together and the sharpener and furnace set at an angle of 70° with relation to the longitudinal line of the building by swinging the working end of the sharpener and forging furnace in a westerly direction from the position shown in Figs. 1 and 1A. The oil-quenching tank for drill shanks may also be set at an angle of 60° with relation to the tempering furnace by swinging the end of the tank nearest the north wall in an easterly direction.

Tin Exports from China

A report from United States Consul-General George E. Anderson at Hongkong says that the present indications are that the Hongkong tin market will be stripped of its supplies in a few months as a result of the marked advance in price in consuming countries and slow supplies from other producing countries. The declared exports of tin from Hongkong to the United States for the first half of the present year have been valued at $2,318,555, as compared with a value of $1,122,242 in the same period of last year, while the highest value of exports in the whole of any previous year was in 1913—$1,632,213. The value of the exports in 1911 was $798,941; 1912, $1,404,115; 1913, $1,632,213; 1914, $769,538; 1915, $983,884; and in 1916, $1,261,737. Exports for the first half of the present year, therefore, are at the rate of about three times the highest record in the history of the trade and in much larger proportion compared with the average.

The exports, up to the limit of the total production, are merely a matter of price. While prices of tin the world over have been high for some time and have stimulated considerable exports from this field, the high exchange value of silver, in terms of which the tin in this field is produced and sold, has operated against this field and in favor of other tin fields where the relations of local currency to gold was more favorable. Fixed exchange for the Straits Settlements, for example, has operated as a direct handicap to Yunnan producers and Hongkong refiners. The extraordinary demand at high prices has so denuded the Straits market, however, that buyers have turned to the Hongkong field perforce. Allowing for delays in supplies from the mines and for a modicum of speculation, there seems to be no question but that at present supplies of tin in the Far Eastern markets generally are barely equal to the demand. There is now on hand in Hongkong a stock of approximately 1200 tons, as compared with about 1500 tons at the beginning of the current calendar year.

Befo' de War in Old Virginny

Among the thirteen original states of the Union it is probable that Virginia has the distinction of being the pioneer in mining. While the premature shipment of sulphur ore brought ridicule upon those who hoped to enrich themselves by mining fool's gold, later efforts of miners in the good Old Dominion state yielded products that were in demand. In the Shenandoah Valley a manganese deposit occurs in "Powell Fort," about nine miles from Woodstock, Shenandoah County. The "fort" did not derive its name from activities tending to disrupt the Union but rather is suggestive of an old retreat of folks who resented inquisitive intrusion. Indeed, it is said that rumors of a mysterious silver mine in the hills, based upon occasional sales of metal, had a tacit relation to contemporaneous stage robberies.

PRIMITIVE WHEELBARROWS FOUND IN VIRGINIA MINE

However, the manganese deposits were really worked, as evidenced by the accompanying illustration.[1] The two crude wheelbarrows were found recently in the workings of a mine now operated by the Stockwood Realty Corporation, Inc. These implements were found embedded in mud, 80 ft. below the surface. There is no positive indication as to the time these wheelbarrows were made and used, as the workings in which they were found antedate the recollection of the oldest inhabitants of the community who are familiar with the intermittent operation of the mine since about 1850. The present state of preservation of these ingenious makeshifts may be accounted for by the fact that they have been under water. They seem to serve as a reminder of the old days, when the darkies may have chanted an accompaniment to the squeaking of the curious wheels as they dreamed of possum, roastin' ears and sweet potatoes.

[1]Photograph and data furnished by C. A. Burdick, mining engineer, 15 Broad St., New York.

The Needles Concentration Mill

By F. C. Smith
General Manager, Chloride Mining Co., Chloride, Ariz.

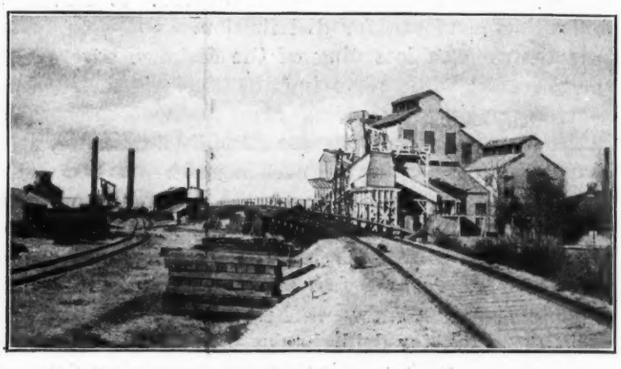
The concentration mill situated at Needles, San Bernardino County, California, is operated by the Needles Mining & Smelting Co., which is a corporation subsidiary to the United States Smelting, Refining & Mining Co. Adjacent to the concentrating mill is also a lead smeltery, owned by the same company but not now in blast. The mill is arranged for the treatment of ores from the Tennessee mine, at Chloride, Mohave County, Arizona—the center of the zinc-lead district of the Cerbat Range. This mine supplies about 200 tons per day—practically the entire capacity of the mill. The ores from the Tennessee mine, as shipped to the Needles mill, have averaged for a recent period of three months 6.4% Pb and 15.47% Zn, with certain amounts of gold and silver.

Flow of Ore Through the Mill

The operation of the mill is as follows: The ore is first crushed in an 11 x 18-in. Blake jaw crusher; then passed to a 5-mm. screen from which the oversize goes to rolls and back to screen, the entire 5-mm. product going to the mill bin. Ore from the mill bin goes to a four-mesh trommel from which the oversize is treated in a Harz rougher jig, making a lead-iron product, the undersize going to a six-mesh trommel. From this trommel the oversize goes to one Harz jig, making a lead-iron product in the first two compartments and a finished zinc concentrate in the third compartment. The undersize from the six-mesh trommel goes to an eight-mesh trommel, the oversize from which goes to one jig, making lead-iron products in first two compartments and a finished zinc concentrate in the third. The undersize goes to a hydraulic classifier, for the purpose of washing out fines, and three products are made. The coarse product from spigot No. 1 goes to two Harz jigs with eight-mesh screens, producing lead-zinc in the first two compartments and zinc concentrate in the third, this concentrate being a finished zinc product and the best made in this mill. If the second compartment does not make a good lead concentrate, the material goes to a Wilfley table for further treatment. The product of spigot No. 2 of the hydraulic classifier goes to two Harz jigs, with eight-mesh screens, in which the first compartment makes a finished lead product, the second makes a middling which goes to a Wilfley table, and the third makes a finished zinc product. The product of spigot No. 3 goes to two Wilfley tables. The overflow goes to an 8-ft. Callow settling tank from which the spigot product goes to Wilfley tables after classifying, and the overflow to Deister slimers, making a finished lead product and a finished zinc product. All residue from Deister machines goes to flotation, making a zinc concentrate.

To return to the jigs: The tails from No. 1 (rougher) jig go to a dewatering wheel, thence to a set of 16 x 36-in. spring rolls, and thence by elevator to one line of two eight-mesh trommel screens. From these the oversize is dewatered and carried to a second set of 16 x 36-in. rolls, thence to elevator and through the same line of trommels, the undersize from the trommels going to the hydraulic classifier, above the No. 3 and No. 4 jigs. Tails from No. 3 jig go to the tube mill and from thence are elevated to the Wilfley-table classifier. Tails from jigs 2, 4, 5, 6 and 7 go to the Wilfley-table classifier.

Of the products of the Wilfley-table classifier that of the first spigot goes to one jig with eight-mesh screen, of which the first two compartments make a finished lead product, and the third makes a finished zinc product. Other spigot products go to Wilfley tables, making finished lead and finished zinc products and middlings which go to Wilfley tables on the lower floor. Slimes from Wilfley tables go to settling tanks from which the spigot product goes to Deister slimers, thence to flotation. Tails from Wilfleys go to vanners for retreatment and to waste. Classifier overflow goes to settling tanks from which the spigot product goes to Wilfley tables. Middling products from upper Wilfley tables go to the lower Wilfley tables, making finished lead-iron and finished zinc products, with middlings which go to the tube mill; the slimes being elevated to two Callow settling tanks. The first spigot product goes to tube mill; the others to Wilfley tables, and the overflow to the Callow tank. Part of the spigot product goes from this tank to the tube mill and part is elevated to upper Wilfleys.



CONCENTRATION MILL AT NEEDLES, CALIF.

The following machines are used: Nine jigs, one four-mesh, two six-mesh and six eight-mesh; eight trommels, handling three sizes, respectively four-, six- and eight-mesh; fifteen Wilfley tables on upper floor and eight on the lower floor; three Deister slimers, and three vanners for retreating fine sands from upper Wilfley tables.

In this mill about 65% of the total lead and 60% of the total zinc are taken off in the jigs. The object sought is to make a finished product at each step, to avoid regrinding and to prevent sliming.

RATIO OF CONCENTRATION
1 ton lead-iron concentrates to 5.41 tons ore
1 ton zinc concentrates to 3.12 tons ore
Total ratio of concentration, 1: 1.89

The assay of mill tails is as follows: Gold, 0.01 oz.; silver, 0.06 oz.; lead, 0.10%; zinc, 2.70; iron, 4.10; silica, 83.60%. The recovery of metals paid for by smelters during three months' run was: Gold 48.42%, silver 64.81, lead 86.22, zinc 80.14%. The flotation product consists entirely of zinc concentrate and represents roughly 10% of the total zinc product. The tables and slimers produce about 35% of the total lead and about 30% of the total zinc.

Cadmium Salts Prevent Flotation of lead sulphides, claims M. H. Thornberry in a paper presented at the Boston meeting of the American Chemical Society. At least, experiments so far completed point to this conclusion.

Mining Practice in the Joplin District*

Description and cost of mining operations in the Joplin district of Missouri, giving methods of prospecting and developing typical orebodies. Methods of drilling, blasting, shoveling, tramming and hoisting are given with itemized costs for each operation.

WHERE ore is found at a depth of 100 ft. or more in the Joplin, Mo., zinc-lead district, the prospecting work is done by churn drill. Several makes of churn drills are used in this work, both steam- and gasoline-driven machines being used. The drilling is usually started with a 6-in. bit, and the size of the bit is reduced, if necessary, as the hole is advanced. It is general practice to drill from 100-ft. to 400-ft. holes, but this is governed entirely by the situation and formation of the ground. In drilling sheet ground,

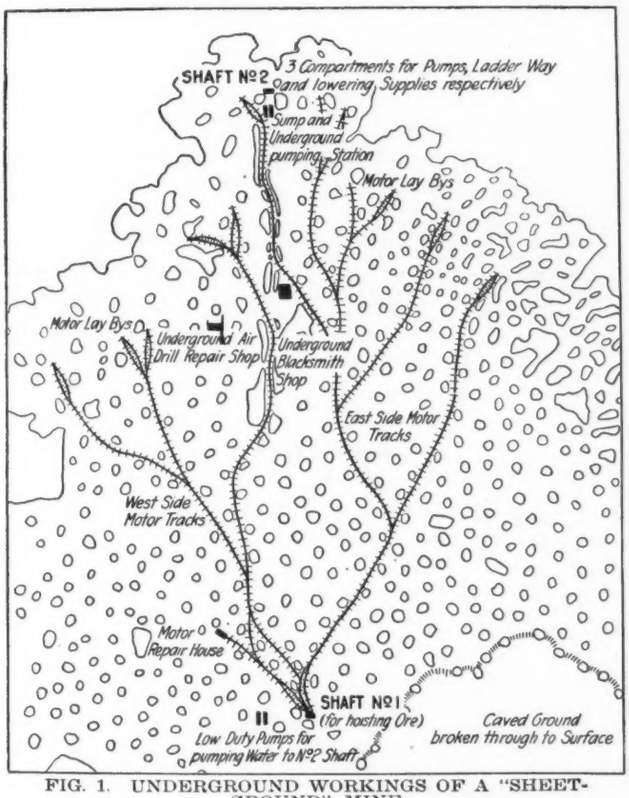

SHAFT No 2
3 Compartments for Pumps, Ladder Way and lowering Supplies respectively
Sump and Underground pumping Station
Motor Lay Bys
Motor Lay Bys
Underground Air Drill Repair Shop
Underground Blacksmith Shop
East Side Motor Tracks
West Side Motor Tracks
Motor Repair House
SHAFT No 1
(For hoisting Ore)
Low Duty Pumps for pumping Water to No 2 Shaft
Caved Ground broken through to Surface

FIG. 1. UNDERGROUND WORKINGS OF A "SHEET-GROUND" MINE

close spacing of drill holes is unnecessary, but in narrow orebodies, the holes are spaced from 15 to 50 ft. apart. Ten years ago, few assay records were kept of the drilling, but during recent years records have been accurately kept showing the situation, elevation, assays, and also the vertical section of the hole.

After the orebody is reached, samples of cuttings are taken every 2 or 3 ft. by pouring the water off the cuttings and taking a portion of the coarse material for assay. It has been found, however, that often the fine sludge that floated off with the water contains valuable mineral. To overcome this, cuttings from each 2 or 3 ft. are put in a container and after the water is evaporated, the sample for assay is reduced by means of Jones riffles.

Permanent records of cuttings showing various formations are kept in glass jars or glued on large cards. Drilling at present is costing from $1.25 to $1.50 per ft. In pre-war times, the drilling costs ran from 75c. to $1 per foot.

Development by Shafts Close to Orebody

After proving a property by drilling, shafts are put down to the orebody. These are usually vertical shafts, either single or double compartment. The dimensions of the one-compartment shafts vary usually from 4 x 5 ft. to 5 x 7 ft. in the clear, while those of the two-compartment shafts run from 5 x 10 ft. to 7 x 12 ft. in the clear. Recently a few three-compartment shafts have been sunk. The shafts are usually put down near the edge of the orebody, so that little drifting is required to open up the ground for stoping. The shafts are usually cribbed with 2 x 4-in. or 2 x 6-in. sawed timbers (few square sets being used because of the nature of the ground), and extend several feet below the top of the solid rock. The cribbing is lined or laced vertically with 1-in. boards, which help to make the shaft free from small rocks and water, and permit faster hoisting. The cost of sinking shafts varies according to the nature of the ground, the amount of water encountered, and the size and depth of the shaft. The average cost of a 5 x 7-ft. shaft, at present, where from 100 to 500 gal. per min. of water is handled, to a depth of from 200 to 250 ft. is from $25 to $30 per ft. Usually two or more shafts are sunk on each property. These shafts are connected with an air drift 5 x 7 ft., which gives good ventilation. The cost of driving a drift varies from $6 to $9 per foot.

In the Granby, Aurora and Galena camps, where ore is found at from 40 to 100 ft., the ordinary practice of developing ground is by sinking small shafts; little drilling is done in proving up the shallow orebodies. A good way to increase tonnage where working faces are limited is by driving a 7 x 8-ft. drift ahead of the working faces to a distance of 300 to 600 ft. and opening up the ground so as to permit the use of several machines. Drill holes are usually necessary for proper ventilation where this method is used.

The methods employed in the underground work vary with the nature of the deposits, and have been developed to suit the local conditions encountered in the various mines. The ore deposits lie in a horizontal plane, and are usually found on one level, varying in heights from 8 to 40 ft. In some parts of the district, however, two distinct levels are found and in a few instances as many as four separate ore strata have been found, each being separated by a relatively thick stratum of hard, barren rock, and the several "runs" are mined independently of one another.

In the mines where the orebody is higher than 16 ft. underhand stoping is practiced, especially in the hard-ore "sheet-ground" mines. Pillars are left at close intervals, the thickness and distance apart depending

*Excerpt from paper by H. I. Young before the American Institute of Mining Engineers to be read at the St. Louis meeting in October, 1917.

on the nature of the ground and the height of the orebody. The ore is usually found in a hard flint formation, known as Grand Falls chert, which lies between beds of limestone. The lime formation is known as the Mississippian, and is overlaid by the Pennsylvanian series of shales and sandstones.

A comparatively small amount of timbering is required in the mining operations of the district, as there is a cap rock of flint varying in thickness from 1 to 5 ft., which makes a good roof in the majority of mines. In some cases, this flint decomposes into what is commonly known as "cotton rock." This is soft and white, and where it occurs pillars must be spaced closely, and the roof arched. In sheet ground from 10 to 20% of the ore is left in the form of pillars. These are sometimes trimmed, and many of them removed after the orebody has been worked out. Fig. 1 shows the pillar system in a typical sheet-ground mine.

Drilling Deep Holes for Stoping

Where the orebody is over 16 ft. in height, it is customary to employ the "heading and stope" method of cutting the ground. The heading is carried on 6- or 7-ft. posts. The face is irregular, which is necessary for the best breaking results. From five to seven holes are drilled at each set up, and the heading is usually advanced from 15 to 20 ft. ahead of the stope. If the stope is over 10 ft. in height, a splitter is drilled horizontally so as to relieve the load on the stope hole. In cases of high stopes, more than one splitter is used. Stope holes are drilled so as to dip below the horizontal in order to maintain a level bottom.

Where the orebodies are less than 16 ft. in thickness, the "heading and overhead stoping" method is profitably employed. A 10-ft. post is used to drive a bottom heading, from five to eight holes being drilled to each round. These holes vary in depth from 10 to 12 ft., and usually from 75 to 150 tons of ore are broken to each round of holes. After the bottom heading is advanced from 10 to 25 ft., holes are drilled in the overhanging ore, and this is blasted down at a low breaking cost. In Fig. 2 is shown a comparison of these two methods.

Two types of air drills are used in this district, the piston and hammer. In sheet-ground mines, where the laying of dust is an important consideration to the health of the miners, the water-hammer drill has been used with great success; it has also shown an increased drilling efficiency of from 25 to 40% above that of the piston machine. Drills are operated by compressed air,

TABLE I. COST OF MACHINE DRILLING

Tonnage broken	136,272
	Cost per Ton Ore
Machinemen	$0.0706
Machine helpers	.0583
Drill repairs	.0257
Drill steel	.0193
Sharpening drill steel	.0234
Oil for machines	.0015
Compressed air	.0453
Air hose and fittings	.0052
Total	$0.2493

at a pressure of from 85 to 100 lb. per sq.in. High-carbon hollow drill steel is used with the wet-hammer drills. Holes are started with a 2¾-in. bit and finished with 1¼-in. It is necessary to change the size of gage in each 2 ft. drilled, and it is sometimes necessary to use several steels to drill 2 ft., when the ground is exceedingly hard. The drill steel is resharpened at an underground blacksmith shop, or on the surface where oil forges have been found to give the best results. Because of the large amount used, it is necessary to sharpen the steel by mechanical sharpeners. Drilling costs vary with the character of ore mined. The tabulation in Table I shows costs for four months of 1917, in a mine where the faces are from 10 to 16 ft. in height.

Blasting Performed by Special Crew

After drilling, the holes are chambered and prepared for powder. Both ammonia and gelatin dynamite of a strength of from 30 to 40% is used, in the form of sticks of from 1 to 1¼ in. diameter. No. 8 caps have been found to give the best results. The powder crew, in mines hoisting on two shifts, do their work on the second shift, firing shots at the end of the shift; this gives the mine several hours to be cleared of powder smoke and gases. It is necessary to have skilled labor for this work, both on account of the high cost of explosives, and for the safety of the men. The rounds are loaded with charges varying from 25 to 150 lb., depending upon the formation of the ground, and the burden of the hole. Blasting costs are from 15 to 30c. per ton, varying with different heights of working faces. The costs shown in Table II are for a 12-ft. working face. These costs are on powder purchased on contract, the present open market price being 70% higher.

TABLE II. COST OF BLASTING

Tonnage	136,272
	Cost per Ton Ore
Labor	$0.0294
Powder	.1314
Fuse	.0057
Caps	.0016
Total	$0.1681

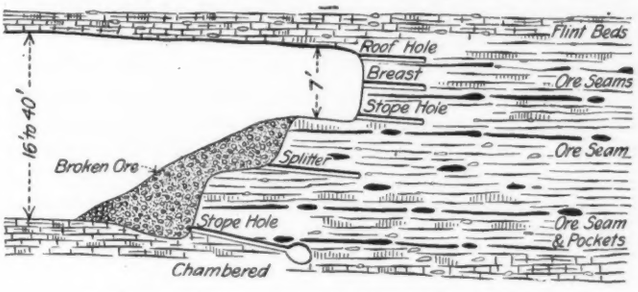
After the ore is broken it is sometimes necessary to drill large boulders with a Jackhamer, and blast them, to reduce them to shoveling size. The usual practice of the district is to shovel into tubs or buckets, which are commonly known as "cans," holding from 800 to 1200 lb. of ore. These are usually 30 x 30 in., 30 x 32 in., or 32 x 32 in., and are trammed to shaft on small trucks. The shovelers use short-handled No. 2 scoops and an average of 20 tons per shoveler per shift is obtained. All shoveling is done on a contract basis, and shovelers earn from $3 to $7 per eight-hour shift. Both the Thew steam shovel and the Myers-Whaley shoveling machine have been used for underground shoveling to good advantage, but without a decrease in the shoveling cost. However, if labor continues to become scarcer, it may be necessary to adopt this method to insure a steady production.

A number of the mines have adopted the use of cars to take the place of "cans." These hold from 1500 to 2000 lb. of ore. The cars are easier to shovel into, as they are lower than the cans. They are also more stable, which permits faster tramming. Shoveling costs vary from 20 to 25c. per ton of ore.

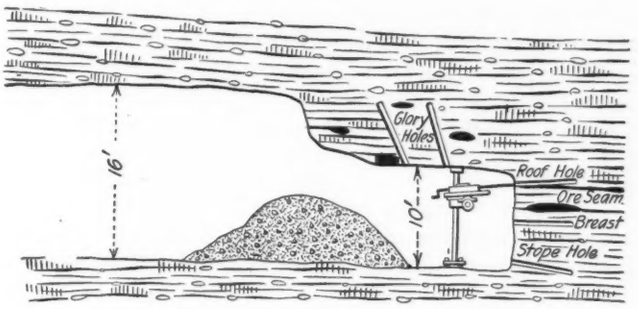
Several different methods of tramming are employed in this field; namely, hand tramming, mule haulage, motor haulage, and rope haulage, depending on the length of the haul, tonnage required and the grade encountered. The tracks are from 15- to 24-in. gage, the rails varying in weight from 12 to 30 lb. per yd.

The trucks are either wooden or steel frames mounted on plain wheel and axle, or on roller bearings. The roller-bearing truck has been found to make a saving in tramming expense.

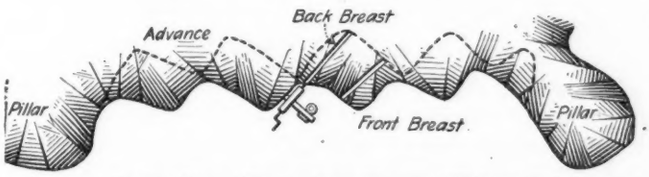
Where the haul is 200 ft. or less, the shovelers usually run their cans directly to the shaft, but for any distance above this and up to 400 ft., additional tramming labor is required to take the dirt from the shovelers' "lay-by" to the shaft. Where a large tonnage is required, as is always the case in sheet-ground mines, and the distance from the shaft to the working faces is from 400 to 1500 ft., mule haulage is successful.



Heading and Stope Method of Underhand Stoping



Overhand Stoping in "Sheet Ground"



A Plan of Heading "Fence Rowed" for Efficient Breaking

FIG. 2. METHOD OF PLACING HOLES AND BREAKING IN STOPES

A mule will haul 100 tons 1500 ft. in an eight-hour shift, at a cost of from 5 to 6c. per ton. In the large sheet-ground mines, where approximately 1000 tons are hoisted in an eight-hour shift, and all of this ore must be hauled 2000 ft. or more, motor haulage is necessary. The six-ton gasoline locomotive is the most popular and gives no trouble with regard to ventilation. Roller-bearing cars are required for long hauls. Rope haulage is used in some mines where the grade is severe. The costs in Table III show comparison of gasoline locomotive and mule haulage for four months of 1917. The distance on locomotive haulage is 1750 ft.; on mule haulage, 700 feet.

TABLE III. COST OF HAULAGE

Gasoline-Locomotive Haulage		Mule Haulage	
Tons hauled	136,272	Tons hauled	81,145
	Cost Per Ton		Cost Per Ton
Engineer	$0.0138	Mule driver	$0.0230
Brakeman	.0122	Maintenance mules	.0051
Oil for locomotive	.0018	Car couplers	.0119
Gasoline for locomotive	.0107	Car greaser	.0058
Repairs	.0151		
Car couplers	.0164		
Total	$0.0700		$0.0458

Three systems of hoisting are used in this district; cans, cages and skips. The can is the best adapted to this depth of hoisting, and the tonnage requirements of the average Joplin mill. Both steam and electric hoists are used. The hoisting cycle is as follows: A trammer or bumper runs a loaded can to the side of the platform and the hoisting cable is unhooked from the empty can on the platform and attached to the load by the tub-hooker; this operation is done quickly and without any signals to the "hoisterman," who now picks up the loaded can which swings in over the platform where the tub-hooker steadies it in the center of the shaft. This is raised to the top of the derrick, where the hoist is situated. Here the hoisterman hooks a tail rope, which is fastened out in front of the sheave timbers, to a ring in the bottom of the can. The hoisting cable is slacked, and weight is taken by the tail rope, causing can to dump directly into the mill hopper. The hoisting cable is now taken up, and the tail rope unfastened so as to allow the can to descend the shaft. With practice, a hoisterman and tub-hooker will become so expert at their respective operations that as many as 150 cans an hour can be hoisted from a depth of 250 ft. The record of a single-compartment shaft for the district is 1071 cans in an eight-hour shift. Where two compartments are used for hoisting, the hoists are placed side by side in the top of the derrick, and the shaft is divided for its entire depth to prevent cans from bumping. The cost of hoisting is between 6 and 7c. per ton, while surface tramming costs 1c. per ton. Table IV shows a distribution of hoisting cost for four months of 1917.

TABLE IV. COST OF HOISTING

Tons hoisted	136,272
	Cost per Ton Ore
Hoisting engineer	$0.0170
Tub-hooker	.0155
Cable	.0052
Hoist repairs	.0033
Hoist derrick repairs	.0008
Shaft lacing repairs	.0007
Steam for hoist	.0202
Slickers for hooker	.0010
Oil and waste	.0005
Total	$0.0642

In order to do all the shoveling on the day shift, and to secure a large tonnage, many of the operators hoist from several shafts, and tram the ore on the surface to the central mill bin by means of inclined surface trams; a few aërial trams are used, but the level topography and short hauls have made the inclined tram nearly universal in this district.

Coöperation in Mine Drainage

The serious problem of pumping in the Joplin mines is not the amount of water to be handled, but, in many instances, the acid character of the mine water. It is seldom that over 1000 gal. per min. has to be pumped at any one mine. In the sheet-ground camp, the mines are so close together that many of them do no pumping at all; where this is the case, a central drainage company is formed, to do the pumping for all the operators benefited. Many types of centrifugal pumps are used underground; the Pamoma, and Texas are favorite surface installations, the Texas being used generally over

the district for unwatering mines, while the large-geared duplex or triplex pumps are usually found in the larger permanent underground pumping stations.

There is no uniform system of cost accounting among the mines of this district. At present, operating costs, which include mining, milling, pumping, miscellaneous and administrative, are from $1.20 to $1.75 per ton of ore mined. On account of high prices of supplies and the scarcity and inefficiency of labor, costs are gradually increasing throughout the district. Table V shows a distribution of mining costs over a period of four years, two before-war years and two during the war.

TABLE V. UNDERGROUND MINING COSTS

	1912	1913	1915	1916
Tons hoisted	306,263	303,331	387,436	347,937
	Per Ton Ore	Per Ton Ore	Per Ton Ore	Per Ton Ore
Ground foremen	$0.0101	$0.0097	$0.0115	$0.0119
Drilling	.1988	.1769	.2576	.2769
Blasting	.1657	.1628	.1845	.1788
Roof protection	.0061	.0044	.0159	.0182
Shoveling	.1557	.1472	.2106	.2341
Conveying to shaft	.0798	.0919	.1092	.1415
Hoisting	.0468	.0433	.0399	.0483
Lighting	.0058	.0070	.0062	.0051
Miscellaneous	.0130	.0076	.0339	.0577
Betterments	.0002	.....	.0066	.0133
Total	$0.6820	$0.6508	$0.8759	$0.09858

Baekeland Discusses Development of Chemical Industry

The notion that this country had no chemical industry before the war was opposed by Dr. L. H. Baekeland who is a member of the United States Naval Consulting Board, in an address at the Exposition of Chemical Industries in New York. Dr. Baekeland's speech was in part as follows:

"As far as the mineral chemical industries are concerned, this country, even before the war, could stand excellent comparison with Germany or any other country. In fact, when it comes to the production of acids and heavy chemicals, the United States in several of these branches was decidedly ahead of Germany. There is no doubt, however, that we were behind in the manufacture of synthetic organic chemicals, which include the coal-tar dyes. But there was nothing strange or abnormal in this situation. The importation of these products into the United States before the war did not exceed $10,000,000 a year, this covering more than 1000 different kinds of products, all of which require special processes of manufacture, and some having to be worked in very small units. As a business proposition, there was little to attract shrewd American business men.

"One chain of 5c. and 10c. stores in 1913 exceeded the total export business of the whole German coal-tar industry throughout the world by $11,000,000. One mail-order house in the same year did more business than all the German color plants together, and the total dividend payment in 1913 of all the dyestuff manufacturers in Germany was only half of a special dividend of one mail-order house in the United States. In 1913 the entire German color industry paid $11,000,000 in dividends, while the Ford Motor Car Co., with one standardized product, did a greater annual business than all the German coal-tar dye plants together, with their 1200 different products, and earned four times their combined dividend while paying three times their wages.

"If Germany specialized in this branch of chemical industry, it was merely because she did not have the same opportunities for enlisting in other fields of enterprise. In this country, we had new mines to exploit, new fields to cultivate, new railroads to construct, and many more industries of immediate importance claimed the full attention of our men of enterprise or scientific training. No wonder then that a paltry little industry of the kind was neglected.

"Nevertheless, as far back as the early 70's, a few enthusiasts started the manufacture of aniline dyes in the United States. They were making considerable headway, but in 1883 they had to perish through unfavorable tariff legislation. At that time German agents were already at work in this country and were leading our textile manufacturers by the nose and they helped them in their lobbying for the lowest tariff on dyestuffs, claiming that Germany would serve them, furnishing them with what they called their 'raw material.' This situation acted as a boomerang and paralyzed our textile industries at the beginning of the war.

"Since then, this country has realized that we must not estimate the value of the color industry in dollars and cents, but by the direct bearing it has as a key to all other industries. A few cents' worth of the right kind of dyes decides whether a hundred dollars' worth of textiles can be sold or not in the open market. What is most extraordinary, almost a wonder, and bears witness to the flexibility and adaptability of American enterprise, is that in less than three years, we should have made ourselves independent of Germany in the line where she had the start on us since half a century."

Presumptions As To Lode Ownership

By A. L. H. Street*

Dismissing suit brought to recover the value of ore taken by defendants from a vein alleged by plaintiffs to apex in their claim, the dismissal being on the ground that the evidence in the case was insufficient to show that the apex was within plaintiff's claim, the Montana supreme court recently laid down the following points of law governing such controversies:

One who extracts ore from a vein under an adjoining claim is prima facie a trespasser until it is shown that the point of extraction was on the dip from an apex lying within his claim. Presumptively the owner of the claim within which ores are found is the owner of such ores. And veins are presumed, in the absence of proof to the contrary, to extend upward at the same angle as exhibited below. These presumptions cannot be overturned by the testimony of expert witnesses who merely give opinions that a vein found under one claim has its apex in an adjoining claim. (Barker vs. Condon, 165 Pacific Reporter, 909.)

A Department of Motor Transport has been created by the Chamber of Commerce of Manchester, England, to assist members in dispatching goods by road and to relieve traffic congestion. A similar scheme is already in operation by the Ministry of Munitions at Birmingham.

*Attorney at law, 829 Security Bldg., Minneapolis, Minn.

Underground Mine Sanitation*

Review of unsanitary conditions prevalent in metal mines and suggestions for betterment. Evils of quartz dust, hot and foul air as affecting the health of mine labor, and its resulting inefficiency. Abolition of dry drilling urged.

WHEN underground sanitation is mentioned, it generally conveys an idea of the process of cleaning up trash, food refuse and maintenance of proper toilet facilities. Making underground working places healthful and the removal or mitigation of conditions that threaten the life and welfare of the miner imply a great deal more than the cleaning up of what are properly classed as nuisances but do not in themselves menace life. Underground sanitation has for its sphere the elimination of certain conditions and processes that are intimately connected with mining; conditions directly detrimental to human life, which, unfortunately, are largely considered as inseparable from mining. It is probable that in spite of the utmost care and effort there will always be an accident hazard to the mining industry; there is no good reason why there should be a distinct health hazard, and the prevalence of miners' consumption is an evidence of the general low price at which we hold human life.

The Effects of Hard-Rock Dust

Health conditions that menace human life underground are largely within the domain of the metal mine rather than that of the coal mine. Foremost in the ranks of offenders against mine sanitation is hard-rock dust. I believe it may be safely asserted that for every man killed or disabled by injury in hard-rock mines, there have been 25 victims of hard-rock dust. The history of hard-rock mining districts throughout the world is predominantly overshadowed by the specter of miners' consumption and, unfortunately, the relationship between cause and effect is not as evident in disease as in injury.

Miners' consumption, be it understood, is a disease of the lungs, mechanically produced by the inhalation of particles of siliceous dust, which research has shown to be so small that they average but three to five microns in diameter. The structural changes produced in the lungs by the action of siliceous dust causes shortness of breath on exertion with a gradual disabling of the miner. The injury to the lung tissue predisposes to tuberculosis, so that the victim of rock dust finally succumbs to the latter disease, usually leaving an impoverished and often an infected family. Miners' consumption has been recognized for centuries, but it remained for the machine drill to elevate it to the position of one of the foremost underground occupational diseases. This does not mean that only the machineman gets the miners' consumption; the shoveler, the timber repairer, the loader, or others who move the broken ground, may also be exposed to the inhalation of siliceous dust. I have seen cases of miners' consumption in millmen who had never worked underground. Generally speaking, the more silica in the dust, the more harmful it is; the flinty dust in the sheet-ground mines of southwestern Missouri, for instance, with a silica content well over 95%, being among the most harmful. When dust is once in the mine air, belief in the protection of miners by respirators or other devices is fallacious; no respirator can be comfortably worn by workingmen and eliminate dust particles less than five microns in diameter. The remedy lies in laying the dust by the proper use of water in drilling and sprinkling. In this country indiscriminate dry drilling is regulated but little by law; many states have laws on the statute books, but they do not actually stop dry drilling. England, South Africa, Australia and British Columbia have enacted laws which enforce severe penalties for dry drilling in hard-rock mines; possibly in some places the law is not strictly enforced, but at least an effort is made. Blasting, chambering holes, leading ore out of chutes, and shoveling may all cause much dust under certain conditions, and the elimination of this by proper sprinkling is law in other countries. A recent investigation of the prevalence of miners' consumption among the sheet-ground miners in the Joplin district, in 1915, indicated that about 35% of them were affected, which is about the same conclusion arrived at after the examination of many thousands of miners on the Rand. In other large hard-rock camps in this country it would appear that the percentage is also large. Suppose, however, we put it as low as 5%; an industry showing 5% of the workers afflicted with an occupational disease reveals conditions that should not be allowed to prevail indefinitely; but it would appear that the situation is not materially improving, and this is true especially where mines are getting larger and deeper.

Methods of Allaying the Dust Evil

The elimination of injurious dust, then, is of prime importance for mine sanitation. It can be secured, first, by doing away with dry drilling. Two methods may be resorted to: The use of drills feeding water through a core in the steel, or the application of water to the holes, while drilling, by water lines, sprays affixed to the drills, or squirt guns. The first is the better method because it insures a constant application of water and puts less reliance upon the coöperation of the miner. Consequently it is less likely to fail. If there are two men to a machine, water lines to the working face are good, as these provide a plentiful supply of water while drilling and for wetting down the muck pile at intervals. Spray attachments fixed to the drill are efficacious, when working, but are apt to be messy and a nuisance, and the history of most places where they have been tried records that the men soon have stopped using them. Squirt guns loaded from buckets of water that have to be carried to the working place are likely to be a failure, especially if the men have to carry water up to a stope or a raise. However, local conditions will usually determine which system is most adaptable. While water-hammer drills and water drills of the Jack-

*Article by Dr. A. J. Lanza, U. S. Bureau of Mines, Pittsburgh, Penn., presented before the mining-section meeting at the sixth annual congress of the National Safety Council, New York, Sept. 12, 1917

hamer type have proved successful, there does not seem to be a wholly satisfactory water stoper for drilling overhead holes. The evolution of such a drill is, however, largely a question of demand. The reason why water stopers have not been as successful as other water drills is probably mainly because of the attitude of the men. Miners usually object to using water while drilling overhead, because of the discomfort that would be caused by the falling water. Proper laws, proper discipline and a little educational work would overcome this objection in time. It should be recognized that it is not sufficient to have a law compelling an operator to furnish dust-laying drills or appliances; the law should go further and make their use obligatory on the part of the miner and provide penalties for his failure to do so.

Effects of Insufficient Ventilation

Poor or inadequate ventilation is another source of danger to the miners' health. As in the case of siliceous dust, the metal mine, rather than the coal mine, is likely to be the offender. I shall include under this heading mines with high temperatures, excessive humidity, gases and powder smoke, as the lack of proper ventilation usually means one or more of the others. The complex problems of ventilation in metal mines, especially large mines, are within the domain of the engineer rather than the sanitarian, but the latter may point out the ill effects that result where ventilation is insufficient.

Where men work under conditions of high temperature and high relative humidity, there is an impairment of physical ability and vitality in proportion to the severity of the conditions. Experience has shown that such impairment begins when the temperature is above 75° F. and the atmosphere is saturated or nearly saturated. Where heat and dust are combined, and this combination is not infrequent, there result conditions especially arduous. Whether working in moist heat alone produces any permanent ill effect on the physical organism is a matter of dispute; but certainly the decreased vitality, if only temporary, affords a better chance for disease to take hold. Where the winter is severe, the sudden transposition from a hot working place to a cold one is a cause contributing to pneumonia and acute chest infections, which in turn help the advance of tuberculosis. Men with dust-injured lungs are particularly liable to pneumonia and chest colds. Among the lesser evils of poor ventilation is the effect of powder smoke, as it would seem that the headache and temporary disability caused by its fumes are the only damage it does. The presence of deleterious gases in sufficient amount to threaten life usually implies an emergency outside of the scope of the sanitarian. So remarkable are the benefits, so far as efficiency is concerned, where previously inadequate ventilation is remedied that further argument is unnecessary in its favor. An example of this came under my observation recently. The cost of driving a long drift, about 2000 ft. below the surface, was $15 per ft., paying on a day-labor basis; the place was hot and moist; a small blower fan was installed at the shaft, with a canvas pipe leading nearly to the working face. Without any other changes the cost was reduced to $8 per ft. In shaft sinking this mine had made 50 ft. in one month and 60 ft. in another. A small blower with canvas pipe was installed and the next month a progress of 120 ft. was made. No better evidence could be given of the deleterious effect of poor ventilation on working ability.

Requisites for Proper Hygiene Underground

Inadequate systems for the disposal of human waste underground will lead to promiscuous ground pollution. This is often an offense against decency, and where conditions are bad, may lead to the spread of hookworm disease, dysentery and possibly typhoid fever. In some of the southern and southwestern mines, this is a real menace. A proper latrine system, adequate to the size of the mine, should always be insisted upon even if it consist of nothing more than the use of empty powder boxes partially filled with sawdust or other material. It is a requisite for the success of any system, no matter how simple or how elaborate, that it shall receive sufficient attention to be kept clean and odorless. If this is not done, the system will fail. Careless disposal of human waste always involves grave possibilities of disease.

Drinking water underground is usually not of good quality. Too often is seen the keg from whose bunghole all comers drink, or to which is attached the cup or dipper. Common drinking devices are no longer excusable, they are dirty and dangerous. If the mine is piped for water, sanitary drinking devices should be installed. Any pipeman can readily improvise them. Where kegs must be used, the lid should be kept locked and so fixed that the men cannot drink from the keg but will be compelled to draw water from a spigot and to use their own buckets or cups.

Metallic poisoning, notably lead, is of importance in some places, whereas various lesser ills are peculiar to certain localities. These can usually be overcome by strict attention to personal hygiene, and the miners should receive instructions in this regard where necessary. However, give the miner good air, protect him from injurious dust and contamination by human waste, and his working place will be sanitary in the real sense of the word.

The coal miner in this country is apparently free from diseases which may be attributed to his occupation. Coal dust apparently does not do serious injury to the lungs and it is claimed by some that it confers actual immunity from tuberculosis. Natural circumstances have compelled the coal mine to be sanitary as far as ventilation and heat are concerned, while the metal mine has been lagging behind. Not that a great deal has not been accomplished in recent years toward improving working conditions, but exposure to dust and humid heat is still entirely too extensive.

In conclusion I urge that the mining section of the National Safety Council go on record as being opposed to the pernicious custom of dry drilling in hard rock. Other countries have done away with it and there is no good reason why it should survive in this country. Eradication of the practice of dry drilling will not entirely abolish the dust evil but it will be the first and most effectual step toward that end.

Coal Operators in Kentucky and Tennessee protested to the Federal Trade Commission on Sept. 11 that many mines in both states will be forced to close unless the prices fixed by the President are revised upward.

Bauxite and Fuller's Earth in Georgia

The supply of bauxite at present is the subject of considerable attention among manufacturers of many different materials. It is also known that a prominent mining company with large interests throughout the United States has recently optioned bauxite properties both in the northern and southern parts of Georgia.

In this connection a brief report entitled "Bauxite and Fuller's Earth of the Coastal Plain of Georgia," just issued by the state geological department is timely The report, which was prepared by H. K. Shearer, assistant state geologist, contains 340 pages of printed matter and a large number of halftone illustrations, together with a geologic map of the coastal plain, showing the location of the individual deposits of bauxite and fuller's earth. The geologic formation of the Coastal Plain is discussed in the introduction, while Part I describes the mode of occurrence of bauxite, its distribution, physical and chemical characteristics, method of mining, preparation, uses, etc. Part II treats of the occurrence and distribution of the fuller's earth deposits of the region, description of individual deposits, methods of mining, uses, etc.

Just now there is an unusual demand for both bauxite and fuller's earth. The former, when made into aluminum, has an extensive use in time of war, in the manufacture of automobiles, aeroplanes, motor boats and all classes of camp equipment. As an alloy with copper it is used in manufacturing cartridges for rifles, shells, helmets, grenades, and, with soft iron, in making shell fuses. Aluminum dust with ammonium nitrate produces an explosive called "ammonal" which has the advantage of being insensitive and stable and also of remaining in perfect condition for a long period.

Georgia fuller's earth is now largely replacing the English fuller's earth which previous to the war was imported into this country for the refinement of cottonseed and petroleum oils.

Giant Blast by Temescal Rock Co.*

The Temescal Rock Co., of Corona, Calif., in a single blast recently broke up 897,000 tons of rock for its crushing plant without losing any of the shattered material over the edge of the 100-ft. bench that serves as the quarry floor. This was accomplished by a system of tunnels so driven that charges of quick-acting explosive would throw out the toe of the quarry face before the force of the remainder of the 48-ton charge was developed. Thus a barrier was formed which served to retain the major portion of the shattered material.

The rock from this quarry is crushed for use in concrete and is an altered rhyolite of eruptive origin, very dense and hard. The formation was solid, the strata inclining into the quarry face at about 16°. Tests of quarry specimens showed a weight of 167 lb. per cu.ft. and tensile and compressive strengths 2245 and 39,500 lb. per sq.in. respectively.

The duplicate tunnel systems were driven at the quarry-floor level, in each of which 18 explosive charges were placed. The tunnels were 3 x 3½ ft. in section and all powder pockets were of such size as to allow 1⅝ cu.ft. of space for each 100 lb. of powder in the charge. The tunnels were driven 140 ft. into the quarry face, and the charges were placed in drifts at right angles to the tunnels, as shown in the accompanying sketch. In the first, or outer, drifts the powder pockets were sunk 4 ft. below the quarry-floor level. In the second drifts the pockets were 2 ft. below the quarry floor, and in the third or last drifts the pockets were at quarry-floor grade.

NO ROCK WAS LOST OVER THE EMBANKMENT DUE TO SPECIAL METHODS OF LOADING AND FIRING

The quantity and the grade of the several charges are given in the following table. Note that charges 13 to 18 consisted of the quick-acting explosive calculated to move the toe of the slope face first. The 60% powder

*An article entitled "Large Blast Accurately Places 897,000 Tons of Rock" in "Eng. News-Record," Sept. 6, 1917.

is simply the priming charge. The detonator used in firing these charges is known as Bickford cordeau, which is chiefly trinitrotoluol, and, in this instance was incased in a ⅜-in. tube. A single No. 8 cap detonated all the charges simultaneously. This cap was attached to one end of the line of cordeau, which was strung

QUANTITY AND GRADE OF BLASTING CHARGES

Load No.	Powder Charges Tunnel No. 1 Grade and Quantity 60%	40%	25%	Tunnel No. 2 Grade and Quantity 60%	40%	25%
1	50	.....	4,150	50	.....	4,300
2	50	.....	3,650	50	.....	3,850
3	50	.....	3,800	50	.....	3,900
4	50	.....	4,450	50	.....	3,550
5	50	.....	4,050	50	.....	3,300
6	50	.....	4,750	50	.....	4,150
7	50	.....	3,250	50	.....	3,100
8	50	.....	3,100	50	.....	2,900
9	50	.....	3,200	50	.....	2,950
10	50	.....	2,950	50	.....	2,700
11	50	.....	3,100	50	.....	2,800
12	50	.....	3,350	50	.....	3,200
13	50	550	.....	50	900	.....
14	50	850	.....	50	850	.....
15	50	800	.....	50	800	.....
16	50	800	.....	50	750	.....
17	50	850	.....	50	700	.....
18	50	950	.....	50	850	.....
Total	900	4,800	43,800	900	4,850	40,700
Grand Total		95,950 lb.				

through the tunnels, each branch terminating in a 20-ft. coil embedded in the charge.

Measurements of the slope after the blast led to the estimate that the 897,000 tons of rock had been shattered by the blast. So effective was the work of the powder that only a slight amount of secondary shooting would be required to prepare the rock for the crusher—probably about one ton of 40% powder for bulldozing each 100,000 tons of rock.

The cost of driving 1000 ft. of tunnel at $5 per foot was $5000. The cost of the explosive was $14,808, to which was added $96.72 for 1860 ft. of cordeau. Loading, tamping and incidental expenses amounted to $603, so that the total cost of the blast was $20,508, or about 2½c. per ton. The tunnel work and the placing of the charges was done under the direction of J. C. Costello (who supplied the foregoing information) and J. C. Cushing, engineers for the California Trojan Powder Company.

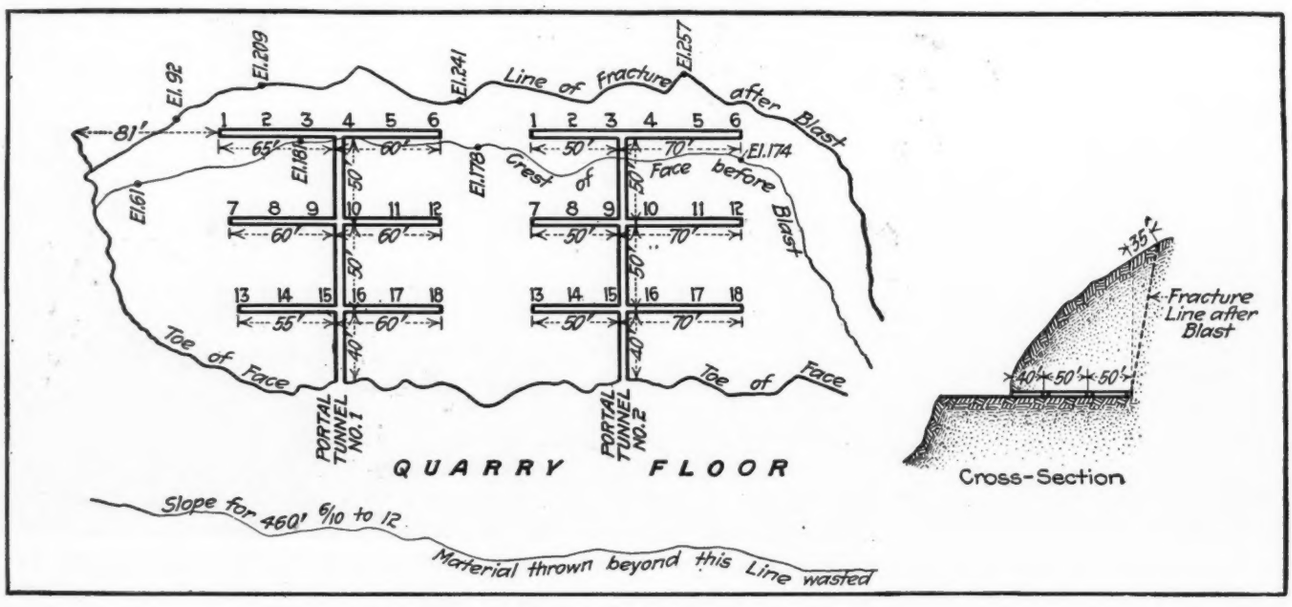


DIAGRAM SHOWING CHARGES AND QUARRY CRESTS

Chemists Display Their Progress

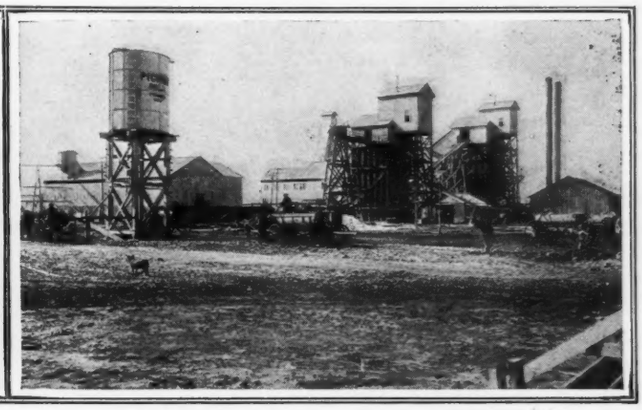
The Western front still holds but the lines of German manufacturers have fallen to American chemists. Evidences of the inroads made were everywhere apparent at the Exposition of Chemical Industries held in New York on Sept. 24-29. Over 300 exhibitors, representing every branch of the chemical and allied industries filled the three floors of the Grand Central Palace. There was something to interest both the technical man and the layman and to impress them with the importance of the chemist in the war's progress and also in everyday life.

Among the many companies upholding the chemist's banner (or spatula) were the du Ponts who were represented in all the branches of their activity; the General Chemical Co.; Semet Solvay Co.; Roessler & Hasslacher; Eimer & Amend; American Cyanimid Co., J. T. Baker Chemical Co. and the Contact Process Co. The displays of laboratory glassware by the Corning Glass Works and the Whitehall-Tatum Co., were notable. The Thwing Instrument Co. showed pyrometers and the Bristol Co. all kinds of recorders. From Denver came exhibits of Wm. Ainsworth & Son, the Denver Fire Clay Co., and the Mine and Smelter Supply Co. Mineral exhibits were abundant; the Freeport Sulphur Co., the St. Lawrence Talc Co., and the Foote Mineral Co., had displays. Several railroads sent exhibits, chief among which was that of the Southern Railway.

Of particular interest to those in mining and metallurgy were the displays of the Anaconda Copper Mining Co., the American Metal Co., the Canadian Department of Mines, the Chile Copper Co., the Dorr Co., Goulds Manufacturing Co., Groch Centrifugal Flotation, Ltd., of Cobalt, Ont.; Hardinge Conical Mill Co., the Huff Electrostatic Separator Co., the Oliver Continuous Filter Co., the Pennsylvania Salt Co., the Raritan Copper Works; Joseph P. Ruth, Jr., (flotation machine) Sturtevant Mill Co., American, Kelly and Sweetland filter presses, Tennessee Coal, Iron and Railroad Co., and Virginia Smelting Co. The Buffalo Foundry and Machine Co. had the most pretentious machinery exhibit.

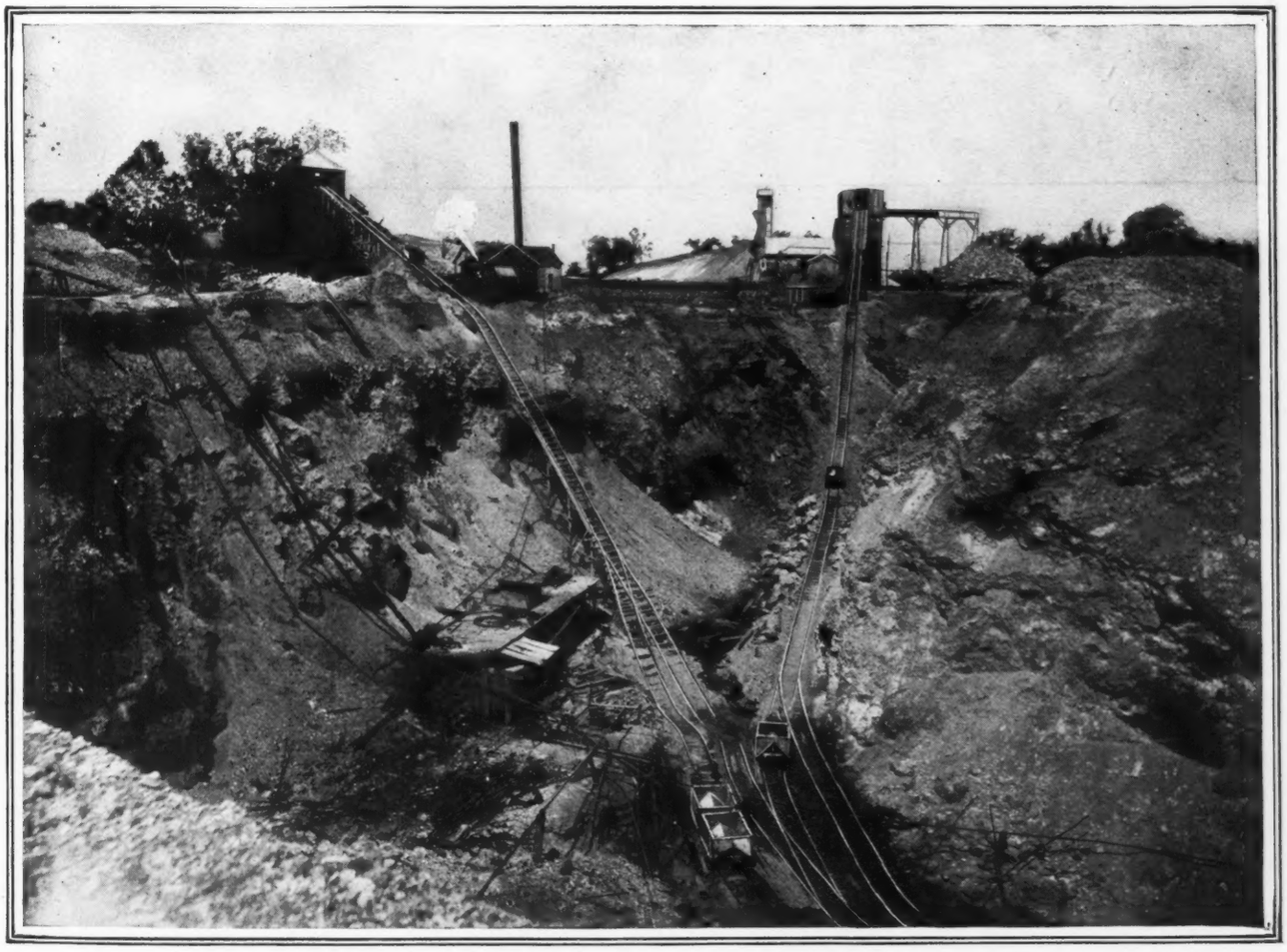
Views from Joplin Zinc-Lead District

PICHER, OKLA., TWO-YEAR OLD MINING CAMP OF 5000 INHABITANTS, JOPLIN DISTRICT



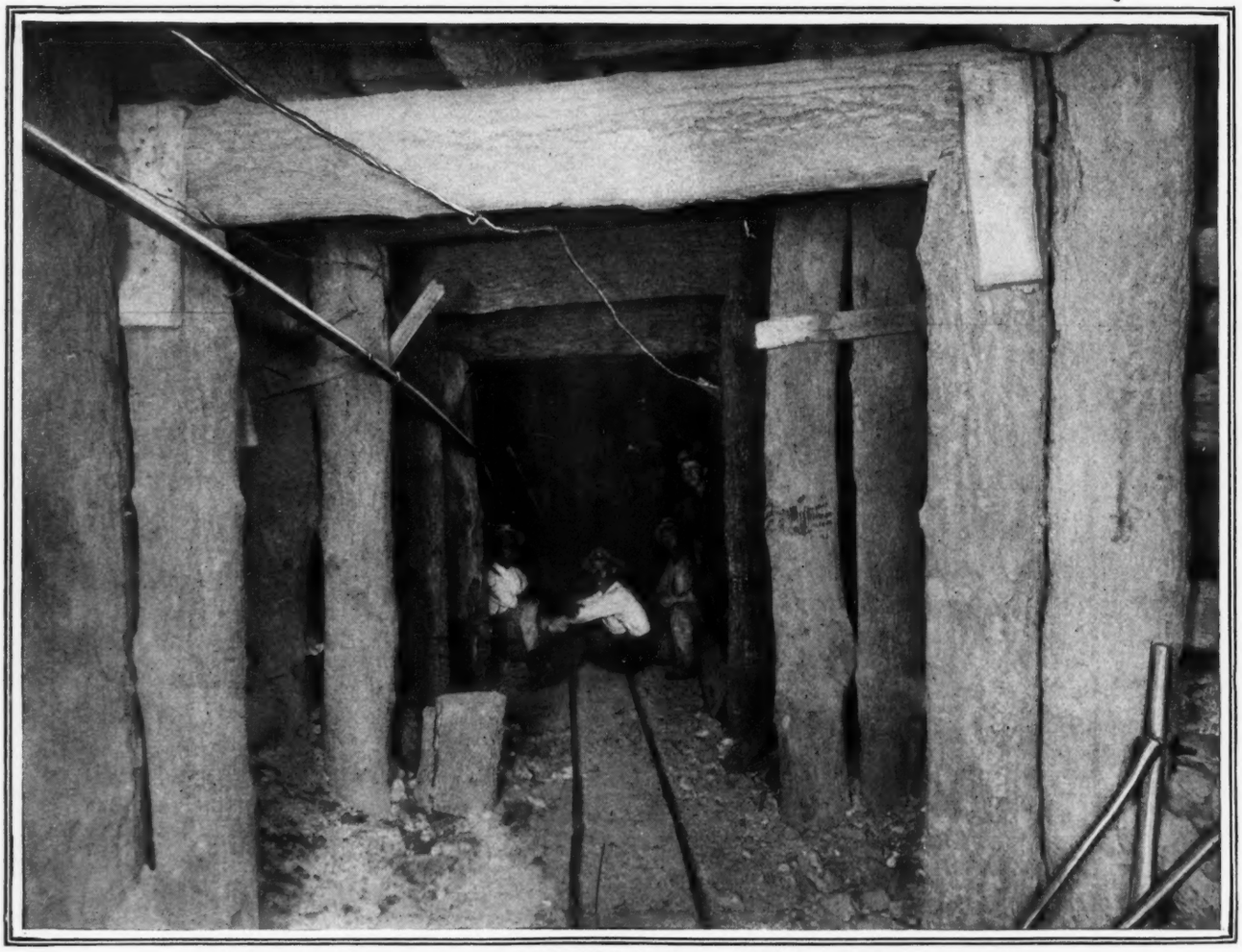
NETTA MILL, PICHER, OKLA. ONE OF THE LARGEST CONCENTRATING PLANTS IN THE DISTRICT

The Joplin district covers an area which includes southwest Missouri, southeast Kansas and northeast Oklahoma. There are over 100 mills in operation and in course of construction in the district treating the zinc-lead ores from 1000 mines operated by nearly as many companies. The ores occur in small lenticular bodies as replacements in a cherty limestone of Mississippian age, known as the Boone formation and forming the so-called soft ground mines. The "sheet-ground" mines are more extensive laterally and are found in a cherty bed below the soft ground deposits, varying from 8 to 50 ft. in height. Joplin produces more zinc than any other district in the country and is noteworthy for its low cost of mining.

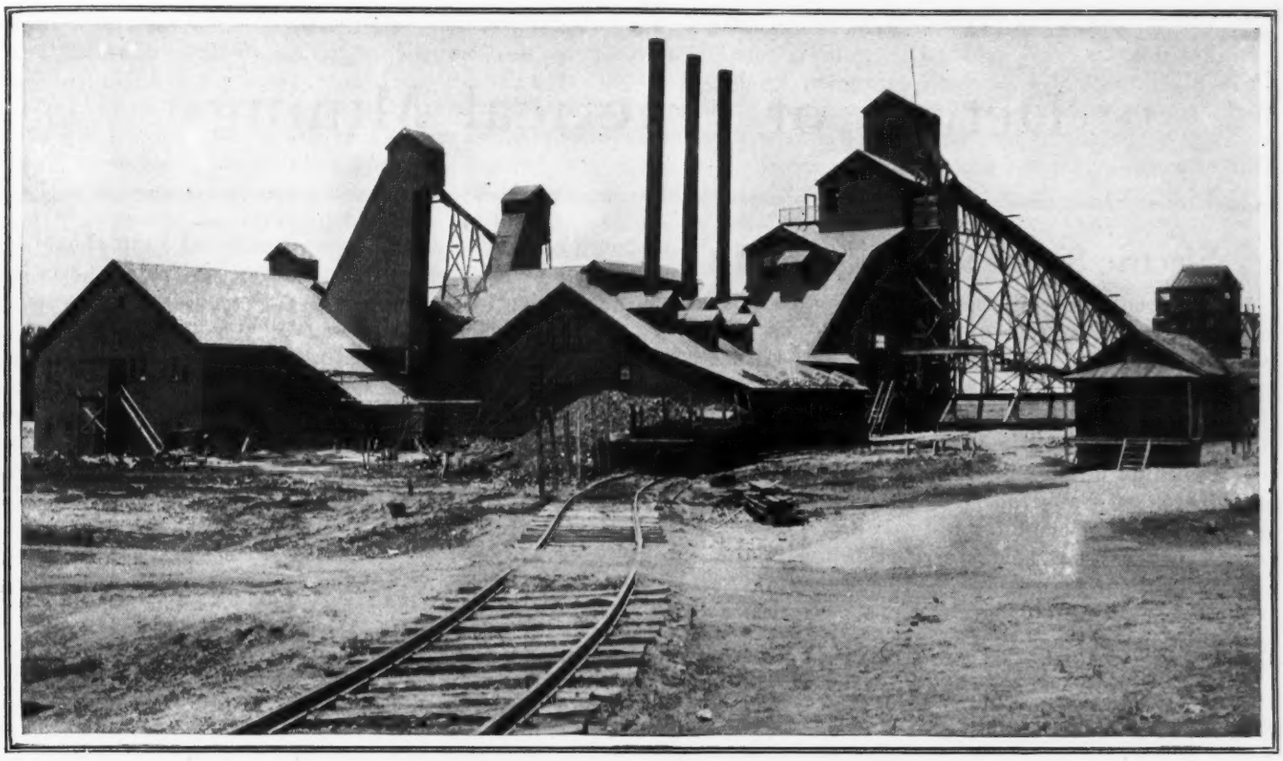


OPENPIT MINE AT CARL JUNCTION IN THE JOPLIN DISTRICT OF MISSOURI

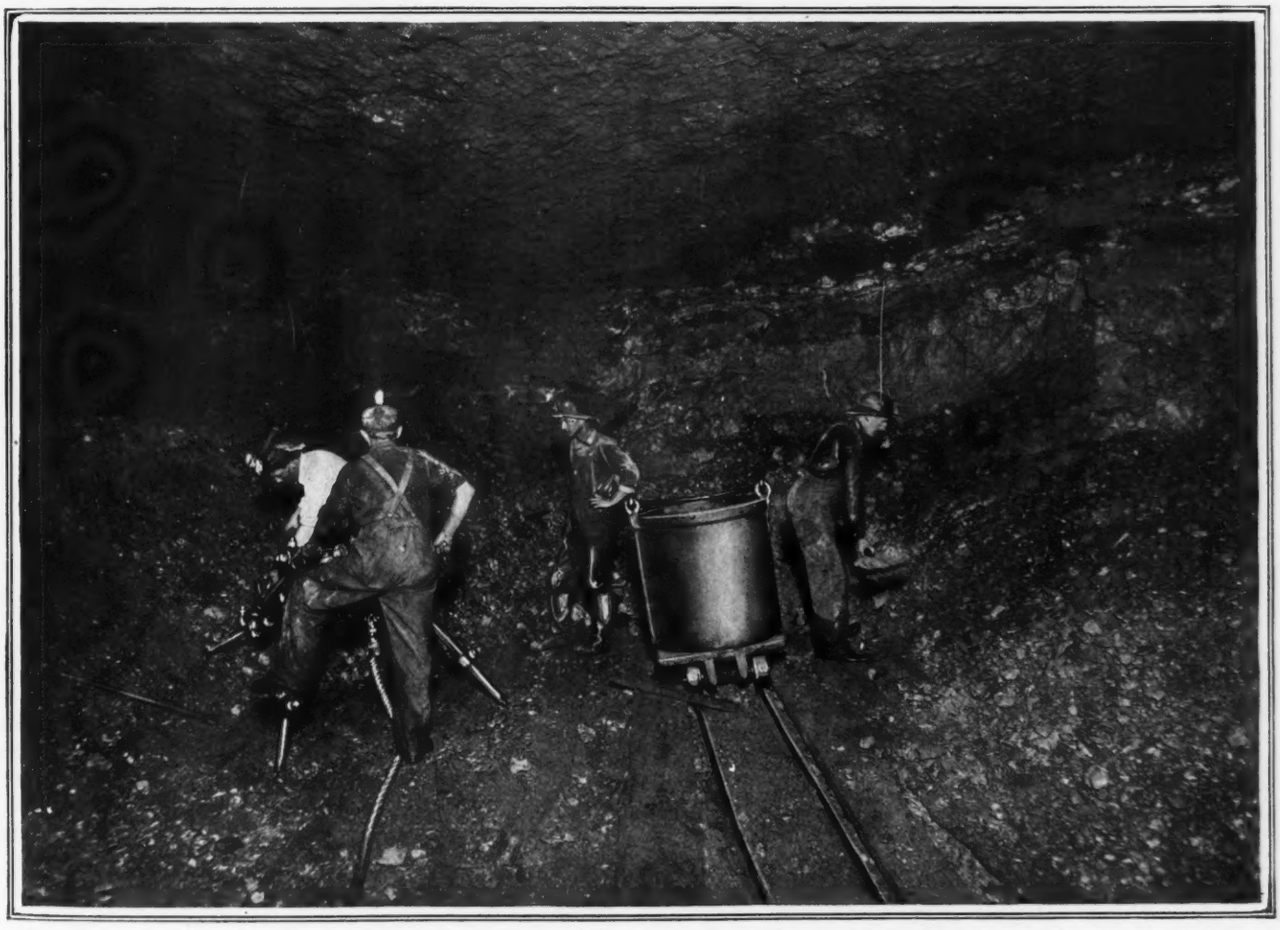
THE NEW ORONOGO CIRCLE MILL OF THE CONNECTICUT ZINC CORPORATION
One of the district's largest mills; rated capacity 2000 tons daily; fed mainly with ore from steam-shovel cuts.



HEAVY TIMBERING IN SOFT-GROUND MINING, JOPLIN DISTRICT, MISSOURI



RAMAGE MINING CO.'S NEW MILL AT DOUTHAT, OKLA.
This mill has just been completed and has a capacity of 250 tons per shift. The company will install an experimental flotation plant



UNDERGROUND MINING AT THE MISSION MINE, LINCOLNSVILLE, OKLA.
In the "sheet-ground" mines of the Joplin district the ore is broken from the breast and shoveled into "cans" or buckets placed on trucks, trammed to the shaft, and the cans hoisted to the surface

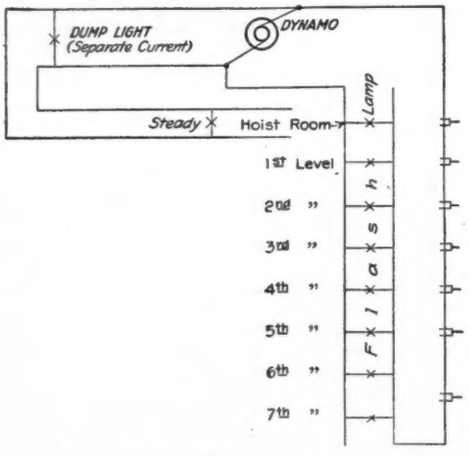
Details of Practical Mining

Electric Signal System for Shafts

In small outlying mines, where power cost is high, only a bell-rope system of signals is to be found in general use. Many accidents have occurred from conflicting signals on the same bell-rope, and wherever this possibly can be avoided by a simple and inexpensive installation there is little excuse for neglect.

If the mine is hoisting from several levels by cages or skips, it probably also operates a compressor. A small dynamo sufficient for a dozen lights or more can be belt-driven from a countershaft belted to the compressor, without noticeably affecting the load.

Electric lighting at shaft stations is so desirable as to require no further comment, and if electric lamps,



WIRING DIAGRAM FOR DIRECT-CURRENT FLASH SIGNAL SYSTEM

placed one at each station and one in the hoist room, can be made to serve as a signal also for calling the cage or skip, a double purpose is accomplished.

To illuminate shaft stations a two-wire parallel circuit is all that is necessary. To make it serve as a signal system a third wire in the shaft is required, as shown in the diagram, and a small but stout two-point switch is put in circuit with this third wire at each station.

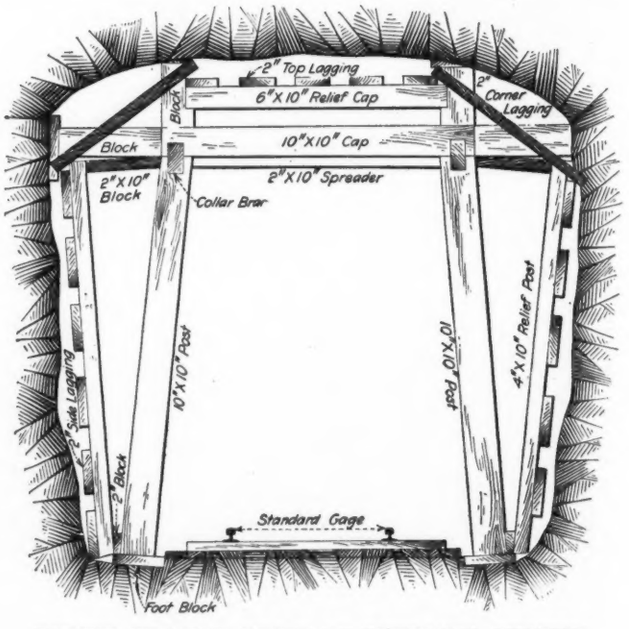
When all the switches are closed all lights are on, but when any one of the switches is open all the lights on the circuit flash out. By flashing out the lights from any station switch according to the signal code in use at the mine the hoist engineer and cagers know simultaneously which level is calling the cage, and at the first opportunity the cager goes to that level by signaling the hoist engineer with the bell rope to send the cage to that level.

By proper insistence all hands but the cagers are thus kept off the bell rope, and station calls cannot be confounded by hoisting or lowering bell-rope signals given from the deck of the cage. Danger from misunderstood signals is far greater with skips in use than with cages. In this case an additional lamp should be placed at each pocket skip-loading platform as well as at each station. Economy in power or greater intensity of illumination can be had by loosening each of the lamps in its socket at all skip-loading stations except the one in immediate use. This decreases the load by nearly 50% of the total number of lamps.

Additional lamps in the hoist room, compressor room, and on the dump, etc., can also be put in a separate circuit with the dynamo and will not be affected by the flashing from the shaft-signal system.

Timber Sets for Large Tunnels in Swelling Ground

The drawing shows a typical timber set such as is in use in the Niagara tunnel of the Burro Mountain Copper Co., Tyrone, N. M. The tunnel is approximately a mile long and for the most part in ground that requires such timber sets. The tunnel is designed for the passage of 30-ton railroad-ore cars of standard gage with the minimum practicable amount of clearance for cars and motor. Where the ground swells it is imperative that



RELIEF SET FOR DRIFT IN SWELLING GROUND

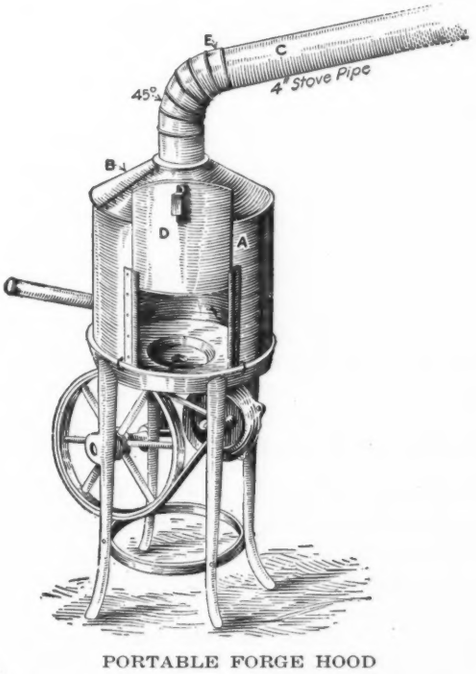
this clearance does not become diminished and this object is accomplished effectively by the use of relief caps and posts that take all the bending stress and can be relieved or replaced if necessary without hindrance to the passage of trains.

In the drawing the cap rests on battered posts. A 2-in. spreader is nailed under the cap and the long cap end blocks are set against headboards. The posts likewise rest on foot blocks. A relief cap is set over the main cap somewhat as shown and supports 2-in.-spaced

lagging overhead between sets. The two relief posts project laterally at all angles but usually, as in drawing, being separated at top and bottom from the main posts by 2-in. blocks. The side lagging consists of 2-in. boards and these are set outside the relief caps and are held against them by a single piece of cross lagging (not shown in drawing) which is blocked against the side of the drift. Small blocks placed between the lagging at the ends keep them properly separated. To protect the corners between sets over the collar braces, short 2-in. lagging is set diagonally, as shown, the ends resting on the top and side lagging or other bracing as sometimes used. The main sets are mostly 10 x 10-in. square timbers but the dimensions of the relief sets shown in the drawing vary in different parts of the tunnel. The main object is to design relief sets that will fail before the main sets become affected by the squeezing of the ground. As soon as a movement is started the bending of the relief timbers gives the warning and the pressure can be relieved by trimming down the back and sides between the lagging and around the blocking.

Hood for Portable Forge

At a small prospect in the tropics a portable forge was used for sharpening and tempering drills and for miscellaneous jobs. As the smithy, carpenter shop, office, etc., were all under one inflammable roof, it was not what an insurance man would call a good risk. The cheapest remedy was to put a hood on the forge, such as is shown in the accompanying sketch. The cylinder *A* and the inverted funnel or cone *B* were made of



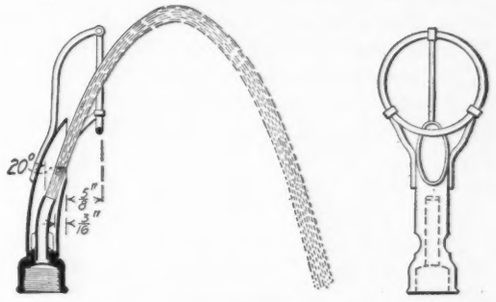
PORTABLE FORGE HOOD

heavy galvanized iron, firmly riveted together. This contrivance was fastened to the forge proper by boring suitable holes in the rim of the cast-iron hearth and in the base of the cylinder *A*. Loops of telegraph wire were then passed through and twisted inside before the clay hearth was tamped in.

A light-weight galvanized stove pipe *C* was connected with the hood by a 45° elbow, so that the products of combustion could be discharged at a suitable distance outside the building. The door *D* was made to slide up and down in simple guides. For special kinds of work, two such doors might be advantageous. At first a piece of wire cloth was inserted in the elbow at *E* as a spark arrester, but it was found to be troublesome and unnecessary. All the sparks and cinders came to rest in the inclined pipe *C*, the cleaning of which when cold was a simple matter.

Types of Drinking Fountains

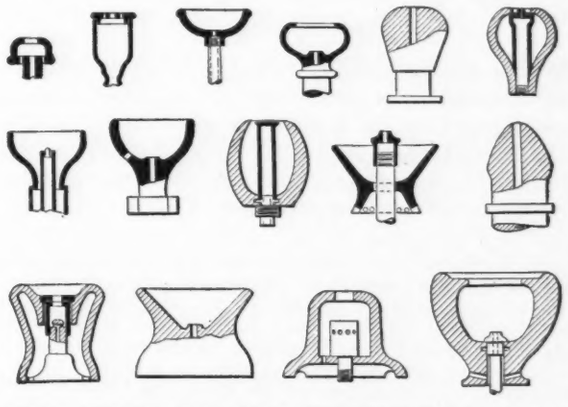
Tests of 77 drinking fountains of 15 different types at the University of Minnesota, according to *Engineering News-Record* showed that due to improper design all were possible sources of infection of the users. No less



THREE TESTS OF THIS PROTECTED DRINKING FOUNTAIN SHOWED NO STREPTOCOCCI INFECTION

than 80% of the fountains and the water from 11% of them contained streptococci, although none were found in the water supplied to the 18 buildings in which the fountains were located. The infection was due to contact between the lips of users and the structure of the fountains, or to water falling back from lips to fountains, owing to vertical discharge of the jet.

To keep lips away from the fountain structure and water from falling back on it, and to prevent water from being retained in fountains with cup- or ring-shaped



TESTS SHOWED 80% OF THESE FOUNTAINS TO BE INFECTED WITH STREPTOCOCCI

depressions, the fountain shown herewith was designed. Three bacterial tests showed no streptococci on either the fountain or the water discharged from it. The study here outlined is reported in detail in a paper by H. A. Whittaker, director of the Division of Sanitation, Minnesota State Board of Health (Reprint No. 397, Public Health Reports, Washington, D.C.). George W. Putnam assisted in the investigation.

Events and Economics of the War

A heavy blow against the I. W. W. has been struck by the Government in the indictment and arrest of over 200 prominent members of the organization on a charge of seditious conspiracy. The leader Haywood was held in $25,000 bail. The campaign for the second Liberty Loan has begun with the objective of raising a minimum of $3,000,000,000. The Trading-with-the-Enemy act has become law, incidentally placing in the President's hands the long-sought power of censorship over the press. The creation of an Aircraft Production Board of nine members has been approved of by Congress. The Senate passed the $8,000,000,000 deficiency bill and adopted the War Revenue bill unanimously as amended in conference. San Francisco ship strikers have been ordered back to work; coal miners in the central field have demanded an increase in wages. The President has fixed the retail price of coal. Hundreds of German messages passed through Swedish channels have been turned over to the Argentine ambassador by Secretary Lansing.

The British have defeated the Turks beyond Bagdad, capturing a general and 4000 men; further advance was made by Haig east of Ypres. In France, Bolo Pasha, a native Frenchman, has been arrested as head agent for German propaganda. The Italians have driven the Austrians from heights in the Isonzo sector. In Russia, the conflict between contending factions goes on. In Argentina, President Irigoyen has so far prevented a declaration of war against Germany; a strong sentiment for neutrality is said to be growing.

Steel Men Receive Instructions on Priority

Twenty-five thousand circulars, giving instructions as to priority in orders and work for all individuals and firms engaged in the production of iron and steel and in the manufacture of articles and implements therefrom, have been sent by Judge Lovett to manufacturers in all parts of the United States.

The War Industries Board divided industry into three classes, directing that preference in transportation of iron and steel and their products be given to them in the order of their importance as related to the conduct of the war. Class A, comprising war work, comes first; Class B, comprising industries indirectly related to the war, second; and Class C, comprising all other industries, last.

War orders of the Allies will be placed in Class A, as will those of the United States. Contracts already placed by the War or Navy departments or by the Emergency Fleet Corporation will be placed in subdivision A1. Orders already placed by the Allies will be put in A2. Orders and work in Class A will take precedence irrespective of the date the orders are given. Both Classes A and B will be divided into subdivisions, as A1, A2, A3, A4, etc., each comprising orders within its class which are regarded respectively as of greater moment. All materials required in the manufacture of an article will be classed with the article itself.

Certificates will be issued on application specifying the classification of the work. Certificates of a subsidiary nature will be issued on request for the furnishing of material and articles required in the manufacture of the commodity ordered. Applications for Class A certificates will be made by the contracting officer of the United States department making the purchase and in the case of the Allies by their agents. Applications for subsidiary certificates covering materials for Class A work will be made by the producer. Applications for Class B certificates will be made by purchasers, as will subsidiary certificates in Class B.

Government Will Purchase Nitrate

Ten million dollars was recently appropriated by Congress for the purpose of securing nitrate of soda, at the discretion of the President, and supplying it to farmers at cost for cash. In regard to this the Secretary of Agriculture has made the following announcement:

It is proposed to coördinate all the Government purchases of Chilean nitrate for this country through the purchasing committee of the War Industries Board, under the immediate supervision of Mr. Baruch, so that there will be no competitive bidding for this material. . . . The price of nitrate on board ship in Chile has greatly increased within recent months without justification. Shipping rates also have increased. The increase is due in part to unfounded statements regarding the demand for Chilean nitrate for munitions purposes and for fertilizer, especially in connection with the $10,000,000 recently appropriated by Congress to purchase nitrate of soda. As a matter of fact, the demands of this country for nitrate of soda will be smaller than heretofore. . . . The quantity which may be purchased for fertilizer use under the special appropriation of Congress will not be an addition to the quantity normally used, but will simply take the place in part of quantities heretofore supplied to the farmers through private agencies.

Incorrect rumors caused by this announcement have led the Secretary of War to issue the following:

Statements having appeared in certain publications indicating that the United States is intending to make at once very large purchases of sodium nitrate for the purpose of immediately establishing a war reserve of 500,000 tons of that material, the Secretary of War authorizes the denial of such intention. No such large purchases have been made or are contemplated, but, on the contrary, practically all the sodium nitrate which it has been planned to procure for the gradual building up of the war reserve, which has been in progress for years, has already been contracted for.

Garfield Rules on Coal Traffic

The following rulings on coal-traffic questions have been made public by the Fuel Administrator, Dr. Harry A. Garfield:

Operators who maintain their own sales department, whether in their own name or under a separate name, and dispose of coal directly to the dealer or consumer are not to be regarded as "jobbers" and may not charge the jobber's commission specified in the President's proclamation of Aug. 23.

Free coal shipped from the mines subsequent to the promulgation of the President's order shall reach the dealer at the price fixed in the President's order, plus only a proper jobber's commission (if purchased through a jobber) and transportation charges, provided, however, that in no case shall the jobber's commission exceed 15c. per ton of 2000 pounds.

Coal from wagon mines or coal delivered from mines direct to the consumer by wagon or truck may be sold at the President's price, plus a sum representing the cost of hauling.

Coal bought by a railroad for its own use as fuel, from a wagon mine, may be sold at the President's price, plus a sum representing the cost of hauling.

If the claim is made that any specific coal has been acquired by the dealer in accordanec with a bona fide contract, enforceable at law, existing prior to the date of the order of the President applicable thereto, the burden of proof is upon the dealer and other parties to the contract to establish these facts.

The effect of the President's proclamation upon coal rolling when the proclamation was issued is to be decided by first ascertaining whether or not the title had passed from the operator to the consignee at the time the proclamation became effective.

Second Liberty Loan Launched

The terms of the second Liberty Bond issue have been announced by the Secretary of the Treasury. Subscriptions were opened on Oct. 1. The amount that is offered is unlimited, with $3,000,000,000 as a minimum. The total issue will be for $3,000,000,000 plus one-half the amount of the oversubscription. The bonds will mature in 25 years and are redeemable, at the option of the Secretary of the Treasury, in 10 years. They will be issued in denominations of $50 and multiples of $50 and will bear interest at 4%, payable semi-annually, on Nov. 15 and May 15. The terms of payment are 2% upon application, 18% Nov. 15, 40% Dec. 14, and 40% Jan. 15, 1918. Bonds of this issue may be converted into bonds of any succeeding issue bearing a higher rate of interest than 4%, during the period of the war, if such conversion is made within six months of the issue of the higher rate bonds.

Coal Miners Again Ask Raise

Demands for wage increases of 25 to 70% have been made by representatives of the coal miners in the central competitive field. Specifically they call for (1) an increase of 15c. a ton for pick and machine mining at all basing points; (2) the percentage of advance granted in machine mining to be applied to all differentials existing between thick and thin veins; (3) an advance of $1.90 a day for all day men; (4) a 20% advance on all yardage and dead work.

The demands have been refused by the operators, who have conferred with the miners' representatives, on the ground that it was impossible to grant them unless the Government revised the prices on bituminous coal. A plea for efforts to obtain a maximum production of coal during the war was made by the Fuel Administrator, Dr. Harry A. Garfield, at the conference. No decision has been reached. Although the advances asked are only for the central district, the wage scale operative in this field serves as a standard for the rest of the country.

Dangers of Bureaucracy

The increasing Federal control over business will necessarily expand the Government's payroll and create hordes of officials of varying importance and of equally varying efficiency. Of course, an increase in salary expenditure is no cause for worry to this multi-billionaire nation, especially when it is obtaining genius for but a dollar a year in so many cases. But a situation such as is said to exist in England at present may well be viewed with alarm. There, if we may believe the London correspondent of the New York *Evening Post*, one is ever in danger of stubbing his toe over the omnipresent official.

Dislike of bureaucracy has ordinarily been a British characteristic. Little did the Briton imagine that a day would ever come when many of his own compatriots would lament that England was herself fast developing into an official-ridden country. Yet that is precisely what is happening now. Lord H. remarked the other day in parliamentary debate that new officials seemed about as numerous as iron crosses in Germany.

This immense expansion of the civil service has been one of the inevitable results of the war. The emergency has compelled the Government to lay a restrictive and regulating hand upon almost everything. "Control," in detail, as well as on a large scale, has been one of the watchwords of wartime, and you cannot control the citizen's activities in so many directions, without setting up a huge body of controllers. The functions of most of the old Government departments have been enlarged and many new departments have been created. There have been instituted a Ministry of Munitions, a National Service Ministry, a Ministry of Food Production, a Ministry of Food Control, a Labor Ministry, a Pensions Ministry, a Ministry of Shipping and, latest of all—but who will confidently say it will be the last?—a Ministry of Reconstruction. Each of them has had to find headquarters of its own and to organize an adequate staff for its operations.

What is happening in some instances was thus described not long ago by a city correspondent of the *Times*: "Firms of the highest standing," he said, "have no objection to very heavy taxation—they know that the war has to be paid for—but they do object very strongly to the transfer of businesses, which have taken generations to build up, into the hands of officials, the qualifications of some of whom are being strongly criticized. It is worth remembering that the firms have assumed obligations toward those of their staffs who are now serving with the forces, and while business after business is being transferred to Government hands, their income derived from legitimate enterprise is ceasing."

Procedure in Controlling Exports of Gold and Silver

A statement has been issued by the Federal Reserve Board in regard to the export control of coin, currency and bullion. As to exports of gold and silver it reads:

It will be the general policy of the board not to authorize the exportation of gold unless the shipment applied for is shown to be connected in a direct and definite way with a corresponding importation of merchandising for consumption in the United States, but in any case authorization will be granted only where the exportation of gold in payment for such merchandise is found to be compatible with public interest. . . .

Applications for the exportation of silver bullion and silver coin of foreign mintage will in general be approved by the Federal Reserve Board upon recommendation of the Federal Reserve bank with which the application is filed.

Travelers leaving the country may carry American silver dollars, subsidiary silver coins and silver certificates not to exceed $200 for each adult; gold coin or certificates not to exceed $200 for each adult.

To Requisition Merchant Vessels

Every American merchant vessel of more than 2500 tons dead-weight capacity available for ocean service will be requisitioned by the Government on Oct. 15, the Shipping Board has announced. In most instances, except where required for actual Government service, the ships, it was said, will be turned back to their owners for operation on Government account subject at all times to any disposition the Shipping Board may direct.

Within less than six months virtually every one of the 458 American vessels now available for ocean service,

including regular liners, will be either in the service of supplying American troops and warships abroad or in trades considered vital to the conduct of the war. The intention of the Government is to replace ships drawn from regular trade routes and from the coastwise service with neutral tonnage, for which negotiations now are pending with neutral governments. Foreign ships will be admitted into the coastwise service by suspension of the coastwise shipping laws. A bill to make this suspension possible is before Congress.

Oil Legislation in Great Britain

The possibility of developing oil in commercial quantities in Great Britain has been so impressed upon the British Government that a bill, known as the Petroleum (production) bill, was introduced in the House of Commons on Aug. 15. Its declared object, according to the *Mining Journal* (London), is to "vest all petroleum in the Government." The nationalization of mines in Great Britain, already effected, has hitherto been represented as a purely temporary movement, but, continues the *Journal* "such a development as that now presented suggests that it may not be altogether easy to revert to the *status quo ante* after the war." The waste of capital and oil, as well as the depletion of fields, caused by private competitive drilling, has apparently been impressed upon the Government by its American advisers.

The bill, as abstracted by the *Journal*, places in the hands of the Government all rights to "get" petroleum and to lease and define petroliferous areas; it provides for the payment of oil obtained within the defined zone by fixed royalties. It also prescribes the terms and conditions under which operators must work, in accordance with schemes to be fixed by the Board of Trade, and sets up the machinery necessary for the purpose. During the war, work must be done under the Defense of the Realm act. After the war the acquisition of surface on which to drill or to erect works may be made under those provisions, by private bill or by provisional order.

Referendum on Price Control

A referendum to ascertain business opinion on price control is being sent forth by the Chamber of Commerce of the United States, which carries a committee recommendation that the National Chamber favor additional legislation to create authority to control prices during the war. It is recommended that this authority should be extended to all articles which have importance in basic industries as well as in war, and which enter into the necessaries of every-day life; to raw materials and finished products; to the prices the public pays as well as those paid by the Government; that it should be administered by a small executive board appointed by the President.

It is also recommended that an agency working in harmony with the board controlling prices should have authority to distribute available supplies to those purchasers whose needs are most directly related to the public welfare; and that each leading industry and trade should create a committee to represent it in conference and to advise with these agencies and the board.

Army Motor Truck Standardized

The designing of the new standardized military truck which must meet the field-transportation problem of modern warfare, has been completed, the Secretary of War has announced. A sample chassis, representing the efforts of about two score truck specialists, will be ready by the middle of October. The new truck will be made in two models, class A and class B. The engine used in the two will be the same in design, except for slight differences in cylinder bore, pistons, piston parts, and riggings. Interchangeability of parts will be possible to a large degree. Class A model will have an actual commercial capacity of three tons and the class B model one of five tons. Both trucks will have a two-wheel drive with a speed requirement of 14 and 12 miles respectively for classes A and B. The adaptability of the new trucks to commercial as well as military uses is indicated by arrangements now being made by a number of manufacturers to produce them for commercial purposes.

Mail Delivery by Airplanes

All military airplanes and motor vehicles not serviceable for war purposes or which, after the war, may be dispensed with for such use will be turned over to the Post-Office Department, if Congress acts favorably upon the joint recommendation of the Postmaster General and the Secretary of War, already approved by the President. Airplane mail routes will be established in this country, if this authority is obtained, as soon as any machines are turned over to the department. Italy and France both have aërial mail routes, the former to Sardinia and the latter to Corsica. Italy is said to be able to deliver in this way 500 lb. of mail in two hours. Discarded motor trucks will in like manner be used in the parcel-post service.

Inflation and High Prices

World inflation, as one of the causes of world advance in prices, is discussed in the current issue of *The Americas* issued by the National City Bank of New York. The author of the article, O. P. Austin, the bank's statistician, calls attention to the fact that world money and world "promises to pay" money have enormously increased during the period in which prices have been so rapidly advancing. World currency, he says, has increased 80% since 1913, world national obligations 142%, and world population only 2½%, while prices of commodities show advances ranging from 60 to 100% in the same period.

Larger Mint Capacity Urged

Methods to increase capacity of mints for coining subsidiary silver were discussed at a conference in San Francisco, on Sept. 13, by heads of various mints and superintendents of Government refineries. Dr. R. B. Baker, director of mints at Washington, presided. General revision of working schedules, ways and means of increasing coinage and revision of assay methods were among the subjects for discussion. The conference was said to be the outcome of the advance in silver quotations.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Exports Board Conservation List

A complete list of the commodities forming what the Export Administrative Board terms its conservation list has been announced as follows:

Acetone, alcohol, aluminum, ammonia salts, ammonia nitrate, anhydrous ammonia, animal fats, arsenate of lead, arsenate of soda, boiler tubes (iron and steel), boring mills, vertical, 42 in. and larger, butter, carbolic acid (phenol), castor oil and castor beans, caustic soda, chrome nickel steel, cotton linters, cotton-seed oil, cyanide of sodium, ferromanganese, ferrosilicon, ferrovanadium, flax, food-grains (including, among others, wheat, barley, corn, rice, oats and rye); glycerin, iron and steel plates, including ship, boiler, tank and other iron and steel plates ⅛ in. thick and heavier and wider than 6 in., whether plain or fabricated; lard, lard compound, lathes with 30 in. swing and larger, mercury salts, nitrate of soda, nitric acid, nitric salts, oil-well casing, oil cake, oil-cake meal, phosphoric acid, phosphorus, pig iron, planers, metal working, 36 in. wide and larger; potash and chlorate of potash, potassium salts, saltpeter, scrap iron, scrap steel, search lights and generators (suited for army and navy use), soaps, sodium sulphite, spiegeleisen, stearine and stearic acid, steel billets, steel blooms, steel ingots, steel sheet bars, steel slabs, sugar, sulphate of ammonia, sulphur and sulphuric acid, superphosphate, tallow, tinplate, toluol, tungsten, vegetable oils, wireless apparatus, wheat, wheat flour, wool rags.

Conservation of the articles on the list is necessary, the Board announces, on account of the limited supply and the needs of the United States, in order that it may prosecute the war advantageously. Exceptions will be made, however, when supplies of these articles are destined for actual war purposes or when they will contribute directly to the same end. In certain unusual cases, when export of these commodities will aid in the immediate production of important articles required by the United States, licenses will be granted. The Board is discouraging applications by telegraph for licenses. It has been announced that no preference will be given telegraphic applications.

Census of Engineers and Chemists Completed

In connection with the census of mining engineers and chemists, undertaken by the United States Bureau of Mines, in coöperation with the American Institute of Mining Engineers and the American Chemical Society, the Bureau has analyzed the returns in a forthcoming publication. Of the 22,000 names which have been classified 15,000 are of men affiliated with chemical industries and 7500 are of those engaged in mining. The returns show that 1840 of the mining engineers have had actual mining experience in gold and silver mines; 1758 in copper mines; 1795 in coal mines; 1384 in lead and zinc mines; 842 in iron mines and 1045 have specialized in petroleum geology.

A separate classification was made of mining engineers, who have had more than one year's experience in a foreign country. Mexico leads this list with 679. Canada is in second place with 384. South America comes third with 241. Other countries in the list are as follows: Africa, 74; Australasia, 46; Austria-Hungary, 7; Central America, 74; Cuba, 68; Belgium, 6; Denmark, 1; France, 23; Great Britain, 116; Germany, 61; Holland, 2; Italy, 5; Norway and Sweden, 19; Russia, 25; Spain, 7; Switzerland, 8; Far East, 105; Greenland, 3; India, 11; Newfoundland, 7; West Indies, 17.

Defense Council Committees Reassured as to Status

In view of an official statement issued by the Council of National Defense, members of its committees, who felt some uneasiness as to their status since the enactment of the food-control law, have been reassured and those who had submitted tentative resignations have agreed to continue to serve. The Defense Council's statement is as follows:

The function of all advisory or coöperative committees of industry of the Council of National Defense is to advise and furnish information to the Director of the Council of National Defense, the War Industries Board, or members thereof, when called upon to do so or upon the committee's own initiative, regarding industries in their relation to the war needs of the United States and the Allied Governments.

In view of Section 3, of the Food Control Law, of Aug. 10, 1917, . . . it will be seen that in making recommendations regarding contracts or orders, every member, agent or employee interested as defined in the law, must not only make a written disclosure of his interest to his own committee but also himself disclose such interest in writing to persons or bodies receiving his or his committee's recommendation. Furthermore, the disclosure . . . must be made whether or not members participate in their committee's recommendations or actions.

Further Price Increase Needed To Stimulate Manganese Mining

An increase of 20% in the price of manganese ores would result in many western properties being able to double their production. This is one of the conclusions formed by J. B. Umpleby, of the United States Geological Survey, who just has returned to Washington after an examination of manganese deposits at Leadville and Red Cliff, Colo., Phillipsburg, Mont., Pioche, Nev., Silver City, N. M., and Shumla, Texas. The inquiry was particularly concerned with the reserves of ore in these districts and reports will be immediately prepared for publication.

Ten producers at Leadville are shipping ores running from 20 to 25% Mn. This ore contains from 25 to 30% Fe. Shipments of 500 tons per day are being made of material of that grade. At Red Cliff, Colo., a considerable tonnage of manganiferous ores occurs under a heavy outcrop and has been partially developed. This material is of satisfactory grade and only a slight advance in the present price will make its extraction profitable. Phillipsburg is shipping more high-grade manganese ores suitable for making ferromanganese than any other district in the United States. These shipments are going to Chicago, Ill., to Birmingham, Ala.,

to Pittsburgh and to electric furnaces on the Pacific coast. The ore runs better than 40% Mn, contains less than 5% Fe and 12 to 20% SiO_2, Mr. Umpleby finds. There are 17 operators in the district, having a combined output of 500 tons a day.

At Pioche a large tonnage of ore suitable for making spiegeleisen is available but its value as a flux, together with its lead and silver content, makes its sale to smelteries more profitable. At Silver City ore is being recovered in considerable quantities from surface cuts. It averages 16% Mn and 35% Fe and is low in silica. Mr. Umpleby believes that the successful use of spiegeleisen at some of the steel mills is certain to lead other steel makers to resort to its use and that this will increase the demand for low-grade manganiferous ores, thereby stimulating mining operations in the manganese-producing districts of the West.

Assessment Bill Passed

Suspension of annual assessment work on mining claims during 1917 and 1918 is provided in a bill which is now before the President for his signature. The bill as it passed the Senate suspended all annual assessment work on mining claims during the war with Germany; the bill as it passed the House limited the suspension to the year 1917. The conferees effected a compromise whereby the suspension of the work was limited to the two years. It is understood that the bill meets the President's approval and will be signed by him within the next few days. The important sections of the bill now read as follows:

That in order that labor may be most effectively used in raising and producing those things needed in the prosecution of the present war with Germany, that the provision of Sec. 2324 of the Revised Statutes of the United States which requires on each mining claim located, and until a patent has been issued therefor, not less than $100 worth of labor to be performed or improvements to be made during each year, be and the same is hereby suspended during the years 1917 and 1918.

Provided, that every claimant of any such mining claim in order to obtain the benefits of this resolution shall file or cause to be filed in the office where the location notice or certificate is recorded on or before Dec. 31, of each of the years 1917 and 1918, a notice of his desire to hold said mining claim under this resolution.

Provided further that this resolution shall not apply to oil placer location claims and this resolution shall not be deemed to amend or repeal the publication, entitled "Joint Resolution To Relieve the Owners of Mining Claims Who Have Been Mustered Into the Military or Naval Service of the United States as Officers or Enlisted Men From Performing Assessment Work During the Term of Such Service," approved July 17, 1917.

Metal Exports Show Large Increase

Exports of zinc manufactures during the year ended June 30 were $66,108,586, according to a statement issued by the Department of Commerce. This compares with $406,208, the value exported in the fiscal year which ended in 1914. Copper and copper manufactures exported in the same fiscal years were $322,284,174 in 1917, as compared with $146,222,556 in 1914. Aluminum exports in the fiscal year ending in 1917 were valued at $20,299,982 as compared with $1,101,920 in 1914. Lead and its manufactures show an increase from $4,122,007 to $16,563,290.

New Railroad Laws Recommended

The following referendum on proposed railroad legislation is being submitted to members of the Chamber of Commerce of the United States:

(1) That provision be made for federal regulation of the issuance of railroad securities; (2) that Congress pass a general railroad incorporation law under which all railroad carriers subject to the jurisdiction of the Interstate Commerce Commission may organize; (3) that if Congress passes a railroad incorporation law, all railroad carriers subject to the jurisdiction of the Interstate Commerce Commission, both those now existing and those hereafter to be created, be required to organize under this law; (4) in view of the fact that conflict has arisen with respect to the jurisdiction of the Interstate Commerce Commission over intrastate rates, even though such rates affect interstate commerce, the committee recommends that the Commission be given authority by statute to regulate intrastate rates when those rates affect interstate commerce.

Work at Northwest and Moscow Experiment Stations

An ore-dressing laboratory has been established at the Northwest experiment station of the United States Bureau of Mines. Two flotation machines, a ball mill, a jig and a table have been installed. Work on copper-nickel ores will be the first undertaken. What is said to be a rapid and accurate method of determining tin in tin scrap has been developed at this station. Ore-dressing equipment also has been installed at the Moscow station.

Katahdin Pyrrhotite as a Source of Sulphuric Acid

Pyrrhotite deposits in the Katahdin region of Maine are regarded with some favor by those who have recently examined them for the Government. Large quantities of pyrrhotite containing 30% sulphur are available and cheap transportation is offered by returning coal barges. It seems, therefore, that the deposits may be worked at a profit.

To Examine Black Hills Tin

An examination of the tin deposits of the Black Hills of South Dakota—as thorough as can be made before snows render further work impossible—has been ordered by the United States Bureau of Mines. It is hoped to determine if tin can be mined under present-day conditions of high-priced tin and improved milling methods. Particular attention is to be given to the northern hills. The work will be conducted by Thomas R. Barley and R. R. Hornor, of the Bureau's staff.

Potash Bill Signed

The Potash bill has been sigend by the President. No conference on it was asked by the Senate and it was accepted as amended by the House and promptly sent to the President. As it was known that he would sign the bill, active efforts looking to the production of potash from Searles Lake had already begun.

Editorials

The Price for Copper

THE main thing about the price of 23½c. for copper is, of course, whether it is going to produce the necessary supply. Profits, taxation, bond issues, everything else, are subordinate to production. Unless there be the necessary supply of coal, iron, copper and other commodities, neither we nor our Allies can carry on the war.

We are doubtful whether the price of 23½c. is going to produce all the copper that is needed. It is certain that the copper production of North America in 1917 is going to be less than it was in 1916. So much time has been lost, owing to the labor troubles, that it is impossible to make up for it. Even if there had been no labor troubles, the capacity of our mines, mills, smelteries and refineries had already been so strained that it is doubtful if further increase in production could have been expected.

The present disorganization of the machinery of our industry is likely to have an adverse effect upon our getting raw material from other countries. It is true that there is nowhere else whither producers in South America can now send their copper for refining, and it may be argued that they will have to accept our price willy-nilly. But it must be remembered, on the other hand, that costs of production have risen in those countries, as elsewhere, that many of their producers have very high costs indeed, that their difficulties are further increased by the depreciation of American currency in their markets, and, finally, that the smelters and refiners in this country who heretofore have bought their copper and paid them promptly for it may no longer be able to buy it at all, owing to inability to finance the transactions. The old machinery by which such business was conducted has been smashed and nobody yet knows if, how or when new methods can be devised.

The rising prices for copper, beginning in 1915, did not succeed in forcing any stupenduous increase in the world's production. Indeed, if it had not been that Inspiration and Chuquicamata at the outbreak of the war were just on the point of becoming producers, it is clear that the world would not, in 1916, have had copper enough. Except for those two new producers, the increased output was in the main derived from the expansion of operations by the older concerns, most of whom, apparently, had reached their limits previous to our entry into the war.

Time only will tell whether the price of 23½c. is going to afford copper enough. If it does not, our Government will manifestly be obliged to raise the price. A dangerous thing in this system is that the knowledge as to whether the price ought to be raised may not be had until too late. It is unfortunate that throughout the discussion of the price question with regard to copper there was a failure to recognize that the major market for copper had never risen to an extravagant figure, not even by comparison with peaceful times, and that the talk of extravagant figures was pure buncombe that ought not to have obtained credence in Washington and ought not subsequently to have been circulated with Government sanction, the Government having gratuitously assumed the position not of uttering a falsehood but rather of stating what was only a half-truth. And, finally, there was failure to recognize that the real price for copper in the major market did not succeed in stimulating production unduly, for, had it done so, there would have been an accumulation of stocks. We feel that in spite of all of its hearings, all of its advice, etc., our Government had but imperfect information respecting the true position of the copper industry.

The Revenue Bill

THE war-profits section of the new Revenue Bill was entirely rewritten in conference. In the rewriting its thought and language were made more confused than they were in the bill passed by the Senate. Nobody, apparently not even the conferees, knows now what it means. How any group of men possessing a high-school education could do such a thing is beyond comprehension. Even if Mr. Kitchin wanted to do it, how could a scholar in politics like Senator Lodge consent to it? The conferees' report was adopted by the House of Representatives on Oct. 1, practically with its eyes shut. However, there was a little debate, in the course of which Representative J. Hampton Moore of Pennsylvania remarked that if Mr. Kitchin, one of the parents of the measure, desired "to leave the sylvan recesses of Scotland Neck, N. C., and go to New York, he could find ample employment in explaining to gentlemen there what the bill meant."

Out of the tangle of verbiage we are able (or think we are) to unravel the meaning with respect to mining companies, once the matter of their invested capital has been determined (which, however, is not going to be an easy thing). But, once their capital has been determined somehow, apparently they are allowed an exemption of 9% thereof; on net income between 9 and 15% they will have to pay 20%; between 15 and 20% they will have to pay 25%; then 35% on the net income that figures between 20 and 25% of the capital; 45% on what falls between 25 and 33%; and 60% of the amount in excess of 33% of the capital.

This is not an excess-profits tax at all. It is not a tax on profits due to the circumstance of war, but, as Otto H. Kahn has remarked, it is "an impost on all profits over an arbitrarily fixed return on capital employed, and the arbitrarily fixed return is a percentage inordinately low and made still more inadequate by the definition of 'capital employed' in an excessively restricted sense."

To mining companies this is grossly unfair. Not only are the best of them entitled to a return of at least 10% upon real capital but, under the terms of

this bill, only a few of them will obtain the benefit of their real capital. Most of them were originally capitalized at a low figure and have increased their capital by legitimate development without, however, writing it into their accounts. It is properly argued that, although a corporation may not have resold any of its properties since the original acquisition, nevertheless the undistributed interests in assets have been the subject of sale over and over again, to the extent that the stock has changed hands. The cost of a property, the capitalization, in such cases may be rightly regarded not as the original cost to the original owners but rather as the cost to the present owners. Thus the par value of the shares of the Utah Copper Co. is only $10, while their market value during 1917 has averaged over $100. Congress does not, however, recognize such ideas of capitalization, and the operation of the new revenue bill is going to be grossly unjust to mining companies of small capital, like Utah, and are reasonable, by comparison only, with regard to companies, like Anaconda, that have a large capital. In determining what is capital under the terms of the law, there will be a wide ground for debate in the interpretation of what is "earned surplus and undivided profits used or employed in the business."

The entire subject of the new revenue bill, in so far as it relates to war profits, is too big and too complicated to be discussed in a single article. We shall have occasion to refer to it many times, for it is going to be a major matter in the economics of the mining industry.

The Second Liberty Loan

THE Second Liberty Loan, the campaign for which has begun, will further test the sincerity of America in the war. The first loan was hailed a success, but was it the response of deep-rooted patriotism or merely the result of exploited emotionalism? The latter will not endure and the billions to be raised will not be forthcoming if patriotism be lacking. But we know that it is not lacking. If all other evidence failed, the ease and orderliness with which the National Army is being created is sufficient proof.

Answering those who maintain that America has no reason to be in the war, Secretary McAdoo, in a recent speech before the American Bankers' Association, recounted in detail the causes leading up to our entry into the struggle. Summing up, he said:

> We had to fight for our rights and so it is that we engaged in a righteous war—a war which we intend to bring to a successful issue by the organized might of this nation. We intend to match organization against organization, science against science, American skill against German skill, American valor against German valor, and I have not the shadow of a doubt that the victory will be complete.
>
> The first essential is money. . . . Our problem is twofold: To supply essential credits to the Allied governments, because it is vital to the cause that their strength and credit shall be sustained; and, secondly, to meet our own requirements.

The new bonds bear 4% interest and are exempt from all taxes except state taxes, superincome, excess-profits and inheritance taxes. The first issue was exempt from such taxes. The change was made, said Mr. McAdoo, because should the Government "continue to exempt from supertaxes bonds issued during this war, the time would come when there would be created in this country a class of people of great wealth, enjoying great incomes wholly free from tax burden. A grave risk would be involved in such a policy."

The campaign is on and the best banking brain of the country is directing it. The loan must and will succeed. To quote Mr. McAdoo again, "The failure of a single issue of Government bonds would be worse for America than a disaster upon the field of battle. We must never let that happen."

The Zinc Committee

THE Committee of Zinc producers that was organized at the beginning of the war to assist the Advisory Council of National Defense has resigned. The members of the committee felt that they had outlived their usefulness, and also were doubtful respecting the legality of their status. The Lever Bill forbade manufacturers from acting in an advisory capacity to the Government and at the same time selling material to the Government. The Zinc Committee was, moreover, embarrassed by the situation in the zinc market, wherein the price for the metal has declined below cost of production in many cases, owing to the accumulation of unsold stock. The Zinc Committee did not feel that it could advise the Government to pay a price less than the cost of production, yet, on the other hand, it could not advise a price that would cover the cost of production when spelter was to be had for less in the open market.

The committee of copper producers has already become a thing of the past, to all intents and purposes, and will be replaced by a committee whose sole function will be to distribute orders among the several producers. The Lead Committee has already been performing a similar duty. The Government is extremely desirous of having the assistance of the producers in such a way but insofar as playing any part in the negotiation of prices, the day of these subcommittees will soon be over.

Exit the I. W. W.

IF the mining industry of the United States had such a means of expressing itself, it would unite with us in singing a hymn of joy over the arrest of the I. W. W. leaders, during the night of Sept. 28, on indictments charging seditious conspiracy, returned by a Federal grand jury. The hymn might become a public pæan of congratulation over the subsequent news that William D. Haywood, who was held in $25,000, and other leaders, who were held in $10,000 each, were kept in jail on account of inability to furnish bonds.

The United States District Attorney's office issued a statement on the I. W. W. activities, saying:

> The propaganda of the defendants consists of assertions that "We are going to take possession of the industries of this country; first, because we want them; second, because we are, in this crisis, possessed of the power to 'put it over.' In addition there is, running through all these endeavors, a pronounced opposition to the support of the war."

The above impresses us as being a very mild and thoroughly conservative statement of the case against the I. W. W. In its own constitution, songbooks and other publications, that criminal organization has declared itself as advocating murder, rape, the wanton destruction of property and the commission of nearly all the crimes on the calendar.

William D. Haywood, the leader of this wicked organization, is one who is especially well known, but not favorably, to the mining industry of the United States, having been an erstwhile associate of Charles H. Moyer in the Western Federation of Miners. During their régime that organization was committed to a criminal career and it left a trail of murder, arson and general outrage through the Western states, which culminated in the assassination of Governor Steunenberg, of Idaho, for which Moyer and Haywood were put on trial. One of their previous associates and tools—Harry Orchard—was a witness against them in the Steunenberg case. He charged Moyer and Haywood with being the direct instigators of the series of crimes that had stirred up the West, including the assassination of Governor Steunenberg. The jury in the case refused to credit Harry Orchard, and acquitted Moyer and Haywood, but many people in the mining industry have always been of the opinion that Harry Orchard told the truth. Sometime afterward Moyer and Haywood parted company, Haywood directing his attention to the development of violence, while Moyer pretended to work in behalf of labor in more peaceful ways although he experienced (if he did not incite) stormy periods at Lake Superior and elsewhere.

We hope that the Government will now see to it that Haywood is kept in a place where he will be unable to do more harm. It has been pointed out by officials of the Government that a large number of the men indicted with Haywood are natives of Austria but we regret to notice among the list a disagreeably large proportion of men of purely American names.

Upkeep of Drill Steel

Elsewhere in this issue we have published an article, by George H. Gilman, on an "Ideal Shop for Sharpening Drill Steel," which will not only be of exceptional interest but also of specific adaptable value to all mine operators in connection with their problems of reducing the cost of machine-drill expense per ton of production. Mr. Gilman, as an engineer of wide experience in the field of machine drills and machine drilling, has given us an authoritative presentation of an important subject, the outcome of long study and extensive research at the mine and in the factory. The best in labor-saving equipment that could be found in actual use throughout the mining districts of the country has been collected, remodeled where advantageous, designed where missing or insufficient and then classified, grouped and arranged into one practical standard workshop designed to do one thing—that thing being the collecting, sorting, cutting, forging, gaging, tempering, inspection and redistribution of rock-drill steel so as to yield the best there is in drill bits and shanks on the greatest possible scale with the minimum amount of labor and time. Every progressive mine manager must recognize the value of Mr. Gilman's contribution to his needs, its excellence and its value in practical adaptability to his conditions. A standard has been set for "doing our bit" at the mines. Everything has been given, floor plans, dimensions and details. Illustrations of special steel cars and all the equipment for each and every step in the process of turning out large quantities of perfectly forged and tempered drills have been provided, and the cycle of operations studied and standardized to eliminate every possible lost motion. This paper should be given serious attention by every mining engineer in the country.

BY THE WAY

The man who in stock exchange gambling indulges should buy on the breaks and sell out on the bulges, but be sure that you do not make any mistakes as to which are the bulges and which are the breaks.

Up in the Minnesota iron country the Indolent Wards of Wilhelm, commonly known as I. W. W.'s, meditated fomenting a general strike. They did not meet with any great success, however, especially at Biwabik. Even the most ignorant of the miners quickly absorbed the meaning of the following notice:

TO THE MINERS OF BIWABIK AND VICINITY

Having duly considered all strike demands which have been made by anyone discontented in Biwabik, we have come to the conclusion that they are without merit, and we believe that the influence which is brought to bear upon those desiring to work is promoted by our public enemy.

Therefore, as loyal citizens of Biwabik and of the United States, and as citizens desirous of maintaining the utmost efficiency of our Government in time of war, we desire to express ourselves as being entirely out of sympathy with any strike movement at this time.

Furthermore, we feel that agitators are agents of our public enemy and should be dealt with as such. Our town is not large enough for agitators, meetings or parades, but our citizens are big enough to enforce the laws.

BIWABIK COMMERCIAL CLUB
(Of Which Every Loyal Citizen in Town Is a Member).

Mark L. Requa, one of our distinguished mining engineers, is one of the "dollar-a-year" men who are helping Hoover in the food administration. Requa recently addressed the National Bankers' Convention at Atlantic City. So strong an impression did he create that a vote of thanks was extended to him, an unusual honor. One banker arose and expressed the belief that food conservation and food control were more important than selling Liberty Bonds. Mr. Requa, who was applauded again and again, paid high tribute to the "dollar-a-year" volunteers who are helping the Food Administration solve its problems. From all parts of the country they came at a moment's notice, dropping important enterprises, to work early and late at their desks in Washington. Herbert C. Hoover, Mr. Requa said, believes that democracy and self-government in business are on trial. The business of the country is having an opportunity to operate under its own rules in furthering the Government's activities. Thus far it has not been necessary in a single case to invoke the wide powers given to the President to commandeer products and fix prices. Mr. Requa urged the bankers to preach, when they return home, the merits of raising hogs, which, he said, were at present the country's most valuable food product. Should the war end suddenly, there will be a plethora of wheat and sugar, but meats would be seriously short. Europe is confronted with the specter of starvation—making our own food regulation a matter of international importance.

September Mining Dividends

Dividends disbursed in September, 1917, by mining companies reached a high total but amounted to a little less than in the same month last year. There were some increases but practically all of them were offset by a decrease in Butte & Superior from $6.25 per share to $1.25, and by the payments by companies last year which do not appear in the present list, such as Champion ($640,000), United Globe ($414,000), Cardiff ($125,000), Utah Apex ($132,050), and Consolidated Interstate Callahan ($697,485). The last-named company passed its dividend in September, the directors having decided on this course because of the war, increased cost of production, and war taxes, which make it advisable to build up a strong reserve. Payments by 43 United States mining and metallurgical companies making public reports amounted to $34,463,831, as compared with $34,536,408 in the corresponding month last year.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Sm. and Ref., com.	U. S.-Mex.	$1.50	$914,970
Am. Sm. and Ref., pfd.	U. S.-Mex.	1.75	875,000
Argonaut Cons., g.	Calif.	.10	20,000
Big Creek Leasing, s. l.	Ida.	.50	2,500
Blackhawk Leasing	Ida.	.10	
Blockhouse, z.	Wis.	1.00	20,000
Bunker Hill & Sullivan, l. s.	Ida.	.50	163,500
Butte & Superior, z.	Mont.	1.25	362,746
Caledonia, l. s.	Ida.	.03	78,150
Calumet & Ariz., c.	Ariz.	3.00	1,927,386
Calumet & Hecla, c.	Mich.	25.00	2,500,000
Chino, c.	N. M.	2.50	2,174,950
Copper Range, c.	Mich.	2.50	987,500
Cresson, g. s.	Colo.	.10	122,000
Eastern Talc	Vt.	.15	10,454
Electric Point, l.	Wash.	.03	23,812
Federal Min. & Sm., pfd.	U. S.	1.75	209,757
Golden Cycle, g.	Colo.	.03	45,000
Grand Gulch	Ariz.	.05	11,992
Granite Gold	Colo.	.01	16,500
Hecla, l. s.	Ida.	.15	150,000
Homestake, g.	S. D.	.65	163,254
Internat. Nickel	U.S.-Can.	1.50	2,510,076
Kennecott, c.		1.50	4,170,874
Loon Lake, c.	Wash.	.01	12,917
M. & A. Mining, z.	Wis.	.25	6,000
Mamma, c.	Ariz.	.50	120,000
Nevada Con., c.	Nev.	1.00	1,999,457
*Nevada Hills	Nev.	.05	53,284
North Star, g.	Calif.	.20	50,000
Old Dominion, c.	Ariz.	1.00	297,071
Oroville Dredg.	Calif.	.12	82,385
Phelps, Dodge Corpn.	U. S.-Mex.	8.00	3,600,000
Quincy, c.	Mich.	5.00	550,000
Ray Con., c.	Ariz.	1.00	1,577,179
Richmond, l. s.	Ida.	.02	16,800
St. Joseph Lead.	Mo.	1.25	1,761,952
United Copper	Wash.	.01	10,000
United Eastern, g.	Ariz.	.05	68,150
United Verde, c.	Ariz.	1.50	450,000
Utah Con., c.	Utah	1.00	300,000
Utah Copper	Utah	3.50	5,685,715
Yak., s. l.	Colo.	.07	70,000
Yellow Pine, z. l.	Nev.	.03	30,000
Yukon Gold, g.	Alas.	.07½	262,500

Canadian, Mexican and So. American Companies	Situation	Per Share	Total
Cerro de Pasco, c.	So. Am.	$1.50	$999,999
Hedley, g.	B. C.	.50	60,000
Kerr Lake, s.	Ont.	.25	150,000
McIntyre Porcupine, s.	Ont.	.05	180,514
Mexico Mines of El Oro, g.s.	Mex.	1.68	302,400
Mining Corpn. of Canada, s.	Ont.	.18¾	311,260
North Am. Magnesite	Que.	5.00	9,330
Rambler-Cariboo, g.	B. C.	.01	17,500
Utica Mines, l. s.	B. C.	.02	32,000

Holding Companies	Situation	Per Share	Total
General Dev.	U. S.	$2.00	$240,000
Yukon-Alaska Trust		1.00	203,433

* Liquidation payment.

Canadian and Mexican companies paid $1,063,004 in September, 1917, and $899,678 a year ago. Dome Mines, which disbursed $200,000 last September, passed its dividend this year, the reason being the difficulties caused by the labor shortage.

Holding companies paid $443,433 in September, 1917, and $1,583,492 last year, the difference being due mainly to the dissolution of the Old Dominion Co., of Maine, which paid $880,059 last September.

The totals for the first nine months of the year are as follows: United States mining and metallurgical companies, $169,327,207; holding companies, $4,631,222; Canadian, Mexican, Central and South American companies, $15,094,720.

It is interesting to note that the porphyry copper companies did not change the amount of their quarterly disbursements but designated them differently. In the case of the September dividends and also those of July the terms "regular" and "extra" were dropped and a certain portion was distributed as a return of capital. Details of September dividends were as follows: Utah Copper, regular quarterly of $1.75 and capital distribution of $1.75; Chino, regular quarterly of $1.25 and capital distribution of $1.25; Ray Consolidated, regular quarterly of 50c. and capital distribution of 50c.; Nevada Consolidated, regular quarterly of 50c. and capital distribution of 50c. Kennecott Copper Corporation also did not change the amount of its dividend ($1.50) but designated 75c. of it as capital distribution.

Minerals Separation Denies Allegations

Minerals Separation North American Corporation has made the following statement, denying charges that it is controlled by German interests:

This corporation was organized under the laws of the State of Maryland in December, 1916, with the full consent of the British government specially obtained in September, 1916, as the successor of Minerals Separation American Syndicate (1913), Ltd., a British company. The directors of Minerals Separation North American Corporation are, and have been since organization; John Ballot, chairman and managing director of Minerals Separation, Ltd., and chairman and managing director of the former Minerals Separation American Syndicate (1913), Ltd.; S. Gregory, director of Minerals Separation, Ltd., and vice-chairman and managing director of the former Minerals Separation American Syndicate (1913), Ltd.; Frank Altschul, partner of the firm of Lazard Freres and an officer in the American Ordnance. These are the only directors and they have absolute control of the affairs of the company.

Until August, 1916, the British company, Minerals Separation American Syndicate (1913), Ltd., was represented in America by agents with the special authority of the British government. As an incident of the organization of the present American corporation that agency and representation were discontinued. There is not a single alien-enemy shareholder of the corporation.

The policy of the company always has been, and now is, to encourage the production of metals and particularly those needed for war purposes. With the decisions now in favor of the corporation and its undoubted right to seek and obtain preliminary injunctions against infringers it has refrained from doing so solely for the purpose of not hampering the industry and not reducing the output of metals so vital to the successful operation of the Allied powers. A recent example is the consent that has been given to the continuance of infringement by the Butte & Superior Mining Co. until the termination of the suit against that company. The court had adjudged the absolute right of Minerals Separation to an injunction but it was stated by counsel for Minerals Separation that if this injunction would cause a shutdown of the defendant's mill, the plaintiff would consent to such terms as would permit defendant's infringing operations to continue pending the termination of the suit. The defendant admitted that the injunction would cause a shutdown and the only question debated was what these terms should be.

The court ordered the filing of a bond for $2,500,000 and the monthly deposit in court of all profits from operations of the defendant. A few days later it was stated by the president of the Butte & Superior Mining Co. that the bond ordered by the court could not be obtained and it was suggested that in lieu of the bond the defendant should submit to an injunction against disposing of its assets otherwise than in the ordinary course of its business pending the termination of the suit. This was consented to by Minerals Separation although it involved relinquishment of absolute

security for $2,500,000. This consent awaits the approval of the court and therefore no further particulars can be given at the present time. The company stands ready to license any and every responsible concern to utilize its process for the benefit of the Allies and to increase as much as possible the production of metals.

It may be of interest to report that the Minerals Separation North American Corporation has about 275 shareholders, of whom all are British subjects except four who are in America. The directors are Britishers except Frank Altschul who is now in the U. S. Ordnance Department.

Wage Scale and Labor Conditions in Montana Copper Industry

SPECIAL CORRESPONDENCE

There seems to be more or less misconception regarding labor conditions in Montana, particularly about the wages paid to men engaged in and about mines. However, when facts are presented in a concrete form, many people will experience a yearning to be on the payroll of such a concern as the Anaconda Copper Mining Co., accepting the generous rate of pay without a murmur of ingratitude. The complications which recently resulted in the shutting down of the Anaconda works were due to the usual machinations of organizers (more aptly termed disorganizers) who so constantly foment such interruptions of industry.

COMPARATIVE SLIDING-SCALE WAGE RATE OF PRINCIPAL OCCUPATIONS AT THE MINES AND REDUCTIONS WORKS OF BUTTE, ANACONDA AND GREAT FALLS

(Based on the Price per Pound of Electrolytic Copper at New York)

	Under 15c.		15c. and Under 17c.		17c. and Under 19c.		19c. and Under 21c.		21c. and Under 23c.		23c. and Under 25c.		25c. and Under 27c.		27c. and Under 29c.		29c. and Under 31c.§	
	Old†	New‡	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Miners, all underground men engaged in mining	$3.50	$3.50	$3.75	$4.00	$4.00	$4.25	$4.25	$4.50	$4.25	$4.75	$4.25	$5.00	$4.50	**$5.25***	$4.50	$5.50	$4.75	$5.75
Miners in shaft, station cutting and winzes	4.00	4.00	4.25	4.50	4.50	4.75	4.75	5.00	4.75	5.25	4.75	5.50	5.00	5.75	5.00	6.00	5.25	6.25
Blacksmiths, carpenters, machinists, electricians, boilermakers, painters	4.50	4.50	4.75	4.75	4.75	5.00	5.00	5.25	5.00	5.50	5.00	5.75	5.25	**6.00**	5.25	6.25	5.50	6.50
Helpers for craftsmen	3.50	3.50	3.75	3.75	3.75	4.00	4.00	4.25	4.00	4.50	4.00	4.75	4.25	**5.00**	4.25	5.25	4.50	5.50
Hoisting engineers (first motion)	4.50	5.00	4.75	5.25	5.00	5.50	5.25	5.75	5.25	6.00	5.25	6.25	5.50	**6.50**	5.50	6.75	5.75	7.00
Hoisting engineers (geared)	4.00	4.50	4.25	4.75	4.50	5.00	4.50	5.25	4.75	5.50	4.75	5.75	5.00	**6.00**	5.00	6.25	5.25	6.50
Boiler cleaners	3.75	4.00	4.00	4.25	4.00	4.50	4.25	4.75	4.25	5.00	4.50	5.25	4.75	**5.50**	4.75	5.75	5.00	6.00
Boiler cleaners' helpers	3.00	3.50	3.25	3.75	3.25	4.00	3.50	4.25	3.50	4.50	3.75	4.75	4.00	**5.00**	4.00	5.25	4.25	5.50
Diamond drill runners	4.00	4.00	4.25	4.50	4.50	4.75	4.50	5.00	4.75	5.25	4.75	5.50	5.00	**5.75**	5.00	6.00	5.25	6.25
Stationary engineers	4.00	4.50	4.25	4.75	4.50	5.00	4.50	5.25	4.75	5.50	4.75	5.75	5.00	**6.00**	5.00	6.25	5.25	6.50
Firemen	3.50	4.00	3.75	4.25	4.00	4.50	4.00	4.75	4.25	5.00	4.25	5.25	4.50	**5.50**	4.50	5.75	4.75	6.00
Laborers, special	3.50	3.50	3.50	3.75	3.50	4.00	3.50	4.25	3.75	4.50	3.75	4.75	4.00	**5.00**	4.00	5.25	4.25	5.50
Laborers	3.00	3.00	3.25	3.25	3.25	3.50	3.50	3.75	3.50	4.00	3.75	4.25	4.00	**4.50**	4.00	4.75	4.25	5.00
Drivers, locomotive, surface	3.50	3.50	3.75	3.75	3.75	4.00	4.00	4.25	4.25	4.50	4.25	4.75	4.50	**5.00**	4.50	5.25	4.75	5.50
Pumpmen	4.00	4.50	4.25	4.75	4.50	5.00	4.50	5.25	4.75	5.50	4.75	5.75	5.00	**6.00**	5.00	6.25	5.25	6.50
Shift bosses	5.00	5.00	5.25	5.50	5.50	5.75	5.50	6.00	5.75	6.25	5.75	6.50	6.00	6.75	6.00	7.00	6.25	7.25
Stationtenders	4.00	4.00	4.25	4.50	4.50	4.75	4.50	5.00	4.75	5.25	4.75	5.50	5.00	5.75	5.00	6.00	5.25	6.25
Teamsters and stablemen	3.25	3.25	3.50	3.50	3.50	3.75	3.50	4.00	3.75	4.25	3.75	4.50	4.00	4.75	4.00	5.00	4.25	5.25
Tool sharpeners	4.00	4.50	4.25	4.75	4.25	5.00	4.25	5.25	4.50	5.50	4.50	5.75	4.75	6.00	4.75	6.25	5.00	6.50

* Heavy-faced type indicates the minimum-wage rate set by the agreement fixing the price of copper at 23½c. per pound.
† Under the columns "Old" are tabulated the rates in effect prior to July 1, 1917.
‡ Under the columns "New" are tabulated the rates in effect from July 1, 1917, till the time the price of copper was fixed.
§ The schedule did not stop at 31c. but continued as per the foregoing increase at the rate of 25c. for each unit of advance in the market price of copper.

The initial trouble was between the electrical men and the Montana Power Co. The men asked for $6 instead of $5 per eight-hour day and also for 5½ days per week and other concessions. It seems that the Montana Power Co. was reluctant to comply with all their requests. Through the union of the I. W. W. and other organizations they got the mechanics of the Anaconda Copper Mining Co. stirred up and this union then sent a committee of three to present demands to John Gillie, general manager of the Anaconda company. The mines are buying power from the Montana Power Co. and the union evidently tried to use this fact as an argument, as they stated that their committee had been instructed to present the following demands: "Unless the mining companies will bring pressure to bear to have the Montana Power Co. grant their demands, and the mining companies grant the demands recently made by the miners, the members of No. 65 employed by the mining companies will be pulled off." Mr. Gillie turned down their proposition and the International Brotherhood of Electrical Workers Local No. 65, walked out.

On June 12 a general strike was called among the miners in Butte. This strike was not very effective until picketing started. Both men and women among the Finns and Austrians started picketing and threatening until only about 50% of the men reported for work. About this time the Anaconda Copper Mining Co. offered the new scale of wages shown in the accompanying table. Conditions were improving when the more radical element organized and went up to Anaconda, encouraged by the promises of Jeannette Rankin, Congresswoman from Montana, who is reported to have told the unions that they were right and that if they stuck it out the Government would take over the entire works and pay them just what they desired. This radical element succeeded in getting the smelter men to quit and on Aug. 24 the smeltery was forced to shut down. This made it necessary for the mines in Butte to close because there was no place to store the ore. The Metal Trades Council, which is composed of 21 different unions, had passed on and accepted the new scale of wages offered by the Anaconda Copper Mining Co., but, in spite of that, these individual unions violated the council ruling and walked out anyway.

W. H. Rogers, the Federal mediator, came and investigated conditions and on Sept. 11 a general meeting was held in Anaconda and the union voted to reconsider the offer of the new wage scale. As a result they accepted this scale and at once they began signing cards requesting to return to work (this in Anaconda at the smeltery), about 1800 having been signed when the company decided to open up again. Work was resumed at Anaconda, Butte and Great Falls. It seems almost assured that German money has been very instrumental if not solely the cause of this unrest.

Right To Drill Through Coal Mines has been established in the Circuit Court of Marion County, Illinois, by Judge Thomas Jett, in an injunction proceeding brought by the Chicago-Sandoval Coal Co. to restrain the Southwestern Oil Co. from drilling an oil and gas well through the mine. The case was dismissed with costs against the coal company, on condition that the hole be drilled through one of the mine pillars that are permanently left to support the surface.

Personals

J. M. Lovejoy, geologist, with the Producers Oil Co. since 1916, has been commissioned a lieutenant.

G. P. Watson, metallurgist, has returned from Chile where he was connected with the Braden Copper Company.

Frederick G. Clapp, chief of the petroleum division of the Associated Geological Engineers, is in Kansas and Oklahoma.

Rush M. Hess, manager of the United Mines Co. of Arizona, is visiting in the East and will be in New York about Oct. 1.

Thomas Neilson, metallurgist, lately returned from Siberia, will sail for the Philippines early in October on professional business.

James S. Douglas, president of the United Verde Extension Mining Co., has gone to France to engage in active Red Cross work.

J. N. Popham, who is operating the Abangarez Goldfields' properties under lease in Costa Rica, arrived in New York on Oct. 1.

Victor Ziegler is the new head of the department of geology and mineralogy at the Colorado School of Mines and **M. F. Coolbaugh** is professor of chemistry.

Charles F. Williams, formerly with the Tonopah-Belmont Co., has been commissioned a lieutenant in the Engineer Corps and is stationed at Fort Leavenworth.

Duke of Devonshire, Governor General of Canada, is making a tour of the mining districts of northern Ontario—the first visit ever paid to this section by a governor-general.

E. L. Hermann, engineer of the Hancock Consolidated Mining Co., at Hancock, Mich., has been appointed assistant superintendent, and **F. C. Schwartzenberg**, engineer.

H. B. Pulsifer, formerly a member of the faculty of Armour Institute of Technology, Chicago, has been named professor of metallurgy of the Montana State School of Mines, Butte, Montana.

Prof. W. G. Haldane has resigned his position in the department of metallurgy at the Colorado School of Mines to become associated with a company operating in the potash fields of Nebraska.

A. A. Krogdahl, in charge of the Lake Superior car of the United States Bureau of Mines, has accepted a position as head of the safety department of the Oliver Iron Mining Co., at Virginia, Minnesota.

Walter E. Segsworth, consulting engineer of Toronto, Ont., has been appointed administrator of the vocational department of the Military Hospitals Commission of Canada, with headquarters at Ottawa.

G. E. Le Veque, engineer for the Interstate Iron Mining Co., at Virginia, Minn., has been appointed chief engineer on the Mesabi Range for the company. **R. Johnson**, of Hibbing, Minn., succeeds him at Virginia.

Ritaro Hirato, H. Tojado and **S. Yamaki**, of Tokio, Japan, were visitors at the Washoe smeltery of the Anaconda Copper Mining Co. at Anaconda, Mont., on Sept. 20. Mr. Hirato is a professor at the University of Tokio.

R. S. Walker, chief engineer of M. A. Hanna & Co.,'s iron-ore properties, has been appointed consulting engineer for the company, with offices in Cleveland, Ohio. He will have supervision over the coal mines and furnaces as well as over the iron mines owned by the company.

P. K. Lucke, formerly consulting mining engineer for the Cia. Minera de Peñoles and Cia. de Minerales y Metales, has resigned his position with those companies and will resume independent practice at 621 Bedell Bldg., San Antonio, Texas. He will be in Cuba in October on professional business.

Obituary

Cortlandt E. Palmer, a well-known mining engineer, died Sept. 21 at Arlington, Vt. We shall publish a biographical sketch of Mr. Palmer in a subsequent issue.

William James Young died in New York, Sept. 22, aged 74 years. He was born in Pittsburgh, Penn., and lived there and in Oil City, Penn., all his life. He was well known in the oil country and was, at different times, head of the Forest Oil Co., the Washington Oil Co., and of a firm which shipped oil down the Allegheny River on barges.

Societies

Coming Meetings

American Institute of Mining Engineers	St. Louis	Oct. 8-13
American Iron and Steel Association	Cincinnati	Oct. 26-27
National Association of Purchasing Agents	Pittsburgh	Oct. 9-11

American Chemical Society—At the fall meeting recently held in Boston, the following papers were presented: "Some Problems in the Metallography of Steel," H. M. Boylston; "Effect of Annealing on the Electrical Resistance of Hardened Carbon Steels," I. P. Parkhurst; "Thermophysics of Zinc and its Alloys," J. W. Richards; "Recent Developments in Connection with the Use of Sulphur Dioxide in Hydrometallurgy," Edward R. Weidlein; "Importance of the Flotation Process in the Metallurgy of Copper," E. P. Mathewson; "Theory of Froth," Wilder D. Bancroft; "Chemicals Used in Ore Flotation," Oliver C. Ralston and L. D. Yundt; "Selective Action of Cadmium Salts on Lead and Zinc Sulphides in Flotation," M. H. Thornberry; "Flotation Experiments on Zinc Sulphide Tailings," W. A. Whitaker, S. F. Farley and H. P. Evans.

American Institute of Metals—At the annual meeting at Boston, on Sept. 24-28, the following papers were among those presented: "Electrolytic Production of Antimony," Prof. D. J. Demorest; "Electrical Properties of Some High Resistance Alloys," Prof. M. A. Hunter and F. M. Sebast; "Amorphous Theory in Metals," Zay Jeffries; "Volatility of Zinc and Cadmium," John Johnston and Edward Schramm; "Surface Tension and Deoxidizing of Metals," W. J. Knox; "Antimony—Its Metallurgy and Uses," K. C. Li; "Development and Reabsorption of the Beta Constituent in Alloys which are Normally of the Alpha Type," Prof. C. H. Mathewson and Philip Davidson; "Pyrometers—Their Construction and Application," John P. Goheen; "Comparative Tests on Test Bars and Actual Castings," W. M. Corse; "Consumption of Copper and its Varied Uses," H. D. Hawks; "Recent Industrial Uses of Aluminum," F. G. Schull; "Stellite," Elwood Haynes; "Electric Furnace and Nonferrous Metals," Dwight D. Miller; "Crucible Situation," M. McNaughton; "Raw Materials Used for Crucibles," Prof. A. V. Bleininger.

American Electrochemical Society — Thirty-second general meeting of the society took place at Pittsburgh on Oct. 3-6. The program included the reading and discussion of the following papers: "Trend in Electric Furnace Design," W. H. Coggswell; "Electric Pig Iron in War Time," Robert Turnbull; "Method of Procedure for the Commercial Analysis of Ferrosilicon," R. E. Lowe; "Resistance Furnace," Frank Thornton, Jr.; "Electric Furnace in the Development of the Norwegian Iron Industry," Haakon Styri; "Copper Castings for Electrical Use," W. M. Corse and G. F. Comstock; "Silver Peroxide and the Valence of Silver," H. C. P. Weber; "Suggested Reforms in some Chemical Terms," Carl Hering; "Application of Radium in Warfare," C. H. Viol and G. D. Kammer; "Chlorine as a War Factor," W. D. Marshall; "Synthetic Gasoline by Electrochemical Means," L. B. Cherry; "Spectroscopic Determination of Small Amounts of Lead in Copper," C. W. Hill and G. P. Luckey; "Electrolytic Recovery of Copper and Sulphuric Acid from Copper Mill Pickling Solutions," J. L. Jones; "Electrolytic Pickling Process and its Effect on the Physical Properties of Metals," J. Coulson; "New Electro Analysis Apparatus," J. L. Jones; "Corrosion of Metals by Acids," O. P. Watts and N. D. Whipple; "Poisoning of Catalytic Agents," W. D. Bancroft; "Fractional Combustion," W. D. Bancroft; "Theory of Contact Catalysis," W. D. Bancroft. Trips of inspection were made to various industrial plants and technical institutions in Pittsburgh and vicinity.

Industrial News

Mark R. Lamb has received an inquiry for a 6-km. pipe line and a 6-km. transmission line for Bolivia.

Gaston, Williams & Wigmore, Inc., merchants of New York, announce that Thomas S. Garrett has resigned as manager of their machinery department. Mr. Garrett will go into business for himself.

Homestead Valve Manufacturing Co., of Homestead, Penn., announces that it has almost completed the rebuilding of its manufacturing plant and office buildings, whereby it now has 75% greater space to take care of the increase in its business. It has also added new machinery and equipment, especially in the foundry where production has been almost doubled in a short time.

Worthington Pump and Machinery Corporation announces the opening of a new branch sales office at American Trust and Savings Bank Bldg., Birmingham, Ala., to take care of a portion of the large territory hitherto controlled by the Atlanta office. Edward Stauverman, formerly with the Atlanta office, will be manager. The territory controlled by the new office will be all of Alabama, excepting the following counties: Choctaw, Clark, Monroe, Washington, Conecuh, Mobile, Baldwin and Escambia; all of Florida, excepting the following counties: Okaloosa, Escambia and Santa Rosa; all of Georgia south of the Seaboard Air Line running from Columbus to Savannah. All inquiries originating in this territory should, hereafter, be addressed to the Birmingham office, instead of to Atlanta.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkalies—Process of Producing Alkalies from Kelp. Harlan L. Trumbull, Seattle, Wash. (U. S. No. 1,238,600; Aug. 28, 1917.)

Compressor. Rudolph Conrader, Erie, Penn. (U. S. No. 1,239,567; Sept. 11, 1917.)

Compressor—Unloader and Relief Device for Compressors. Rudolph Conrader, Erie, Penn. (U. S. Nos. 1,239,566 and 1,239,568; Sept. 11, 1917.)

Drill—Roller Boring-Drill. Clarence Edward Reed, Houston, Tex. (U. S. No. 1,236,983; Aug. 14, 1917.)

Drill-Head for Drilling-Machines. Joseph F. Buhr. Detroit, Mich. (U. S. No. 1,237,017; Aug. 14, 1917.)

Electrolytic Cell. Noak Victor Hybinette, Christiania, Norway. (U. S. No. 1,239,012; Sept. 4, 1917.)

Excavating System. Charles A. Morris, Montclair, N. J.; Clara R. Morris, executrix of said Charles A. Morris, deceased, assignor to The Hayward Company, New York, N. Y. (U. S. No. 1,238,801; Sept. 4, 1917.)

Excavation — Distant-Power Excavating-Machine. William F. Brinton, Washington, Iowa. (U. S. No. 1,236,904; Aug. 14, 1917.)

Excavator Bucket or Shovel.—Robert M. Downie, Beaver Falls, Penn., assignor to Keystone Driller Co., Beaver Falls, Penn. (U. S. Nos. 1,237,878, 1,237,879; Aug. 21, 1917.)

Ferrouranium—Process of Manufacturing Ferrouranium. Robert M. Keeney and Louis F. Vogt, Washington, Penn., assignors to Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,240,056; Sept. 11, 1917.)

Furnace. Richard Ziesing, Cleveland, Ohio, assignor to The Grasselli Chemical Company, Cleveland, Ohio. (U. S. No. 1,237,141; Aug. 14, 1917.)

Furnaces—Hearth of Blast-Furnaces. Rudolf Kunz, Georgsmarienhütte, near Osnabrück, Germany. (U. S. No. 1,236,721; Aug. 14, 1917.)

Metallic Sulphides—Process of Treating Substances Carrying Sulphur and Metals. Arthur S. Dwight, New York, N. Y. (U. S. No. 1,238,279; Aug. 28, 1917.)

Miner's Gas Lamp—Frederic E. Baldwin, New York, N. Y. (U. S. No. 1,237,450; Aug. 21, 1917.)

Power-Shovel. Edwin J. Armstrong and Holger Rommerdale, Erie, Penn., assignors to Bull Engine Co., Erie, Penn. (U. S. No. 1,239,554; Sept. 11, 1917.)

Rotary Furnace Structure. Byron E. Eldred, New York, N. Y., assignor to the Commercial Research Co. (U. S. No. 1,238,394; Aug. 28, 1917.)

Rotary Pump. Albert Hayes, New York, N. Y., assignor to Carnot Development Corporation. (U. S. No. 1,238,139; Aug. 28, 1917.)

Sand-Settling Box. John F. Reinert, South Elgin, Ill. (U. S. No. 1,237,959; Aug. 21, 1917.)

Slag-Removing Mechanism for Open-hearth Furnaces. Walter A. Kosinski, Chicago, Ill. (U. S. No. 1,238,526; Aug. 28, 1917.)

Suction Dredge. Vasco F. Casey, Minneapolis, Minn. (U. S. No. 1,238,260; Aug. 28, 1917.)

Editorial Correspondence

SAN FRANCISCO—Sept. 28

Petroleum and Gas Deposits are under protection of a law recently amended by the legislature in 1917, providing for elective commissioners sharing certain powers and responsibilities with the state oil and gas supervisor. The state for this purpose is divided into 5 districts: (1) Including the counties of Los Angeles, Riverside, Orange, San Diego, Imperial, San Bernardino; (2) Ventura; (3) Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, San Benito, Santa Clara, Contra Costa, San Mateo, Alameda, San Francisco; (4) Tulare, Inyo, Kern; (5) Fresno, Madera, Kings, Mono, Mariposa, Merced, and all other counties not included in other districts.

Sixty-eight New Oil Wells were completed in California fields in August. In the week of Sept. 7, the number of new wells was 13. The total from Jan. 1 to Sept. 15, was 753. The nine wells reported for abandonment in the second week of September were mostly poor wells in developed areas and did not represent failures in new ventures. There was an increase in production of oil in August over July which is attributable mostly to a total output of 20,000 bbl. daily from three wells. These wells are in Midway Sunset field. One of the most remarkable developments recorded by the State Mining Bureau was the discovery of gas in the Casmalia field in Santa Barbara County. The well is less than 800 ft. deep and after flowing three days was said to have produced at the daily rate of about 300,000 cu.ft. The oil and gas supervisor of the bureau reports elections of district oil and gas commissioners from the various districts on Sept. 17. The commissioners will coöperate with the supervisor in protecting oil fields from damage by improper drilling methods.

Discovery of Gold in California, in respect to the exact date and precise site, is again puzzling the pioneers and the sons of the pioneers; and the state administration, which has been prolific in the creation of commissions, has just appointed two commissions to look after these very important matters. One of these commissions will not only decide where the gold was discovered by Marshall on the American River, but will also make some improvements and possibly, changes in the Marshall monument. The other commission will decide whether or not the date which has been written into the history of the state is really the date on which the gold was discovered, and if it should prove to be erroneous, the date will be changed on the monument. The commissions are made up principally of native sons and daughters of the Golden West. So it is quite likely that the pioneers who have selected a site different from that commonly known as the place of discovery are not likely to have much to say, about it. Whatever the decision may be, the administration is likely to write it into the history of the state by legislative act. The fact that gold was really discovered and some of it shipped to Boston a great many years before Marshall's discovery, does not seem to have any effect upon 49'ers or their following. When or where gold was discovered in California is not so important just at the present time as when and where other important minerals may be discovered and how they may be treated to commercial advantage. While the administration is adding to the commissions for the sake of history, the State Mining Bureau and the state university are endeavoring to add to the prospective mineral production of the state by investigations and explorations in the field of special minerals. This work is vastly more important just now than the work of these commissions.

Deaths in California Mines and Mills in the first half of 1917 numbered 30, an increase of eight over the same period in 1916. The fatalities in 1917 were from the following causes: Five by rock falls; nine, powder smoke; one, hang-fire shot; one, run over by ore train; one, fall from muck pile; one, fall of drill steel down a raise; one, drowning in sump; one, bucket falling down shaft; two, runaway skips; one, struck by skip; one, electrocuted in transformer house; one, clothing caught in drive shaft in shop; four, caught in machinery belts; one, electrocuted in mill. In addition to the 30 above described, five men were killed in tunnels; one, fell off runway with wheelbarrow; three, caught by hang-fire shot; one, suffocated by powder smoke. There were four fatal quarry accidents; one, from suffocation from rope attached to a belt improperly used to prevent falling into rock bin; three, rock falls. There were two fatal gold-dredge accidents during the first six months of the year; one man was killed by having his arm caught in the stacker belt, the other by collapse of a derrick. H. M. Wolfiin, chief mine inspector, is inclined to attribute the high death rate at the mines, partially to the fact that many inexperienced men have sought work because of the increased wages. There has been a continued scarcity of mine labor during the whole of the present year. The higher wages paid at the copper mines has been largely responsible for the scracity of men available at the gold mines. The mining division of the Industrial Accident Commission and the California Metal Producers Association are doing all possible to urge mining men to greater diligence in the observation of safety rules, not only the rules laid down by the commission, but the common-sense rules that all intelligent, careful miners are expected to observe. Stress is laid upon the surprising fact that so many miners have been overcome by powder smoke. Most of these have have been experienced men who seemed to believe that it was safe to work wherever their candles or carbide lights would burn. Reference is made to the recent fatalities in a Mariposa County mine to men who tried to work in a drift of the lowest level during a shutdown of the compressor plant. Too much stress cannot be laid upon this feature of mine accidents. In a description of this particular accident, the "Journal" in the issue of June 16, 1917, called attention to the ignorance or negligence of the men who went into the drift knowing that the air had been shut off for several hours, although with permission of the underground foreman. The lesson taught by that accident is that there are times when men can stand a great deal of powder smoke without serious injury, while at other times the smoke contains so much poisonous gas that they are quickly overcome. Falling rock is another feature of mine accidents in this state. Prior to the organization of safety work, the green men employed as muckers, mostly foreigners, resented the advice of experienced men and adopted their own methods of barring down loose rock in stopes. Under the laws governing the operation of mines with respect to accidents. these men are now compelled to obey orders. So that for some time after mine inspection was inaugurated the accidents from this cause were chiefly unavoidable. Now that there is increased necessity for the employment of inexperienced men, the miners who wear the Safety Bear buttons are urged to employ greater care and diligence when warning green men of the dangers of carelessness and ignorance.

BUTTE—Sept. 29

Montana's Compensation Law, according to the second annual report of the state industrial accident board, has caused to be paid out in compensation, medical and hospital fees for the two years ended June 30, 1917, the sum of $804,168, which has gone to 15,127 injured employees and to beneficiaries and dependents. Pending claims will call for an expenditure of about $231,500, making a total liability for the two years of $1,035,668, or a constant average payment of about $1500 a day. The cost of administration was about $20,000 a year which is infinitely less than similar costs in other states of the union.

Strikers to Publish Daily Newspaper in Butte, it has been definitely decided. The strikers, as well as the labor element and public generally, are constantly expressing their grievances against the Butte newspapers, charging that they will not print the news, or any news unless it is favorable to the mining companies and censored by them, and that they constantly and maliciously misrepresent local conditions. They will try the novel experiment in Butte of publishing a newspaper without a copper mine or bank to liquidate a monthly shortage, or overdraft. They can at least count on a lot of experience and excitement, although they also claim to have sufficient money and at least twice the number of paid up subscribers that any of the other papers has. While the strike of miners and smeltermen in Anaconda and Butte has not been settled, and a large number of men still refuse to return to work, the Anaconda company officials say the return of men is satisfactory. In proportion there are more men at work in the mines than in the smeltery at Anaconda. The official claim is that 6500 men are at work in the Butte mines, which is about 60% of the normal, but the production of ore is not in the same proportion, as there is a large percentage of inexperienced men employed. Many men, attracted by the high wages, have been going into the mines for the first time. Several thousand men are still on strike and several thousand more have left the district, many of them for good.

Fixing of Copper Price brings feeling of relief by ending the uncertainty as to the effect of it on the wage scale. The Anaconda company announced the scale of wages would not be reduced for the next four months. The announcement was made in the form of notices being posted at all of the company's properties in the district and reads as follows: "Under the arrangements with the United States government, fixing the price of copper at 23½c. per pound, it was understood that so long as the price remains so fixed, the wages of employes should be continued upon the same basis as at the date of the agreement, Sept. 20, 1917. The wages at that time, under the sliding scales in force, were based upon a price for copper between 25c. and 27c. per pound. This scale is higher than would be payable under the existing contracts and schedules, but will be continued by the Anaconda Copper Mining Co. so long as the arrangement fixing the price for copper at 23½c. is in force. When this is no longer in force, the Anaconda Copper Mining Co. will follow the sliding wage schedules in force at the time of the above fixing of the price of copper by the United States government." Under this schedule the miners will receive $5.25 a day. Every effort is being made to reach normal production in the Butte mines and at the smelteries in Anaconda and Great Falls. At several of the Butte mines practically full day and night shifts are already working and new men are reporting every day at all the mines and smelteries, so that full crews are expected to be employed within a short time.

DENVER—Sept. 29

Highgrading in various mining camps of the state, notably the Cripple Creek district, has resulted in the passage of a law providing that it shall be unlawful for any person, whether acting for himself or as agent for another, to sell or purchase any ores, concentrates, amalgams bearing gold, silver, tungsten, vanadium, uranium, molybdenum, or other rare minerals, gold dust, gold or silver bullion, nuggets or specimens of a value of $10 or more, unless at the time of the sale the vendor shall sign and deliver to the purchaser a memorandum in which he shall state the date of the sale, his residence, the nature and amount of the article sold, the source from which the vendor obtained the same, and the consideration actually paid. Every person required to receive a memorandum shall preserve the same for one year, so that at any reasonable time it may be inspected by a representative of the Secretary of State. Violation of the law shall be punished by a fine of not less than $50 nor more than $500, or by imprisonment in the county jail for a term not to exceed six months, or by both fine and imprisonment. The act does not apply to those persons or corporations duly licensed in the milling, sampling, or ore purchasing business.

Compensation Insurance Laws were amended by the Twenty-first General Assembly in a manner which is of special interest to lessor and lessee. The owner of any property upon which any business is carried on, who contracts out work on his premises to any contractor, subcontractor, person or persons who hire four or more employees, is liable for injuries or death.

The phrase "every employer" is synonymous with the phrase "every lessor" to the exact extent that every lessor of mining property is liable for compensation to men employed by the lessee. The employer is liable for an injury in case of accident to the lessee or his employees when the lessee employs less than four men and when he employs more than four men. The phrase "every employer" includes a non-resident lessor who owns mining property in the state, even though he may not be the direct employer of the lessee's men. It is evident that the legislature in enacting this section intended it to be highly remedial and somewhat analogous to the mechanic-lien laws. The law was intended to catch every person who owns property or operates his business exclusively or in part in the different ways set out in the amendment, and the intention of the amendment was to afford security to the employees of subcontractors and lessees.

Colorado School of Mines will continue to be without a president for at least 20 days longer, according to the action of Judge James Cooper of Canon City, presiding in the Denver district court. The court has dismissed the complaint in the suit instituted by Edwin H. Platt, A. F. Hewitt. Lester C. Thompson, John G. May, and Herman Fleck, whereby an attempt was made to restrain the trustees of the Colorado School of Mines from ratifying the recent appointment of Victor C. Alderson as president of the institution. However, the court left in force a temporary restraining order which prevents the confirmation of the appointment until the Supreme Court, to which the plaintiffs gave notice they would appeal, obtains jurisdiction in the case. It was held that the plaintiffs, who sued in the capacity of taxpayers, had no right to maintain such an action because no money was involved. Council for the plaintiffs asked for a 30 days' stay of execution of the judgment which was entered in favor of the defendants, but upon objection of the defendants' attorney the court limited the time to 20 days. Plaintiffs will now make application in the Supreme Court for a writ of supersedeas. At the earliest opportunity the state's highest court will be asked to review Judge Cooper's decision. The original complaint named the entire board of five trustees, but was aimed at A. E. Carlton, James T. Smith and H. M. Rubey, who according to the charge, entered into a conspiracy to place Victor C. Alderson at the head of the school, without consulting the other members of the board. It appears that these three members of the board, who took independent action, insisted upon following their course in spite of the fact that they had been recipients of vigorous protests from prominent members of the alumni association of the school and former members of the faculty. According to those who oppose the appointment of Alderson, the most convincing evidence of his unfitness was placed before Messrs. Carlton, Rubey and Smith, who ignored all statements that were in conflict with their personal views of the matter. The unfavorable publicity which three of the trustees have given to the school has attracted the serious attention of certain members of the state legislature. These lawmakers confess freely that they are sick and tired of the continual rumpus at the school of mines, due to incompetent trustees and unfavorable local influences, and that they propose to launch a campaign designed to accomplish the removal of the school from Golden to Boulder, where it may be made an important branch of the state university and be permitted to develop as it well deserves, under the supervision of a competent board of regents. Such a change would mean not only greater efficiency, but much duplication of work would be avoided and considerable money would be saved by the state. Many of the substantial graduates of the school are now heartily in favor of such a change, for they believe that as a prominent branch of the state university the school of mines will prosper in a favorable atmosphere and, instead of losing its identity, will become more famous.

SALT LAKE CITY—Sept. 28

Tunnel at Park City being driven jointly by the Judge Mining and Smelting Co., the Conkling Mining Co. and the Keystone Mining Co. to develop their territory has been held up by an injunction granted the Silver King Coalition Mines Co., under contention that a diversion is threatened of the water supply in the Alliance tunnel of the Coalition company, which affords water for the company's mill and a part of the water for town use in Park City. Preliminary arguments have been presented by the contending companies, and work on the tunnel will be discontinued until such time as the case is fully heard before the court, and the matters at issue are fully presented.

WALLACE, IDAHO—Sept. 28

Idaho Mining Association has undertaken to compile a pamphlet giving valuable information regarding the mining industry of Idaho, which is expected to be of great value in attracting investments to the state. The work is in charge of Ravenal Macbeth, secretary of the association. It will give a comprehensive description of mining development in the various counties and the actual amount of money being spent annually in bona-fide mining operations, the idea being to impress investors with the fact that Idaho is not a "wildcat" mining state; that it possesses great and varied mineral resources and that their exploitation offers a legitimate field for investment.

Star Mining Co.'s Litigation with the Federal Mining and Smelting Co., in which the ownership of ground valued at millions of dollars is involved, is set for trial on Oct. 25. The case is brought in the Federal court for the district of Idaho, and by special agreement Judge Deitrich will hear the case in this city. The Star company alleges that in the course of operating the Morning mine the Federal company has trespassed upon the ground of the plaintiff on various levels and extracted therefrom ore valued at more than half a million dollars, and in the course of which has developed orebodies estimated at more than a million tons. The case will turn on the question of apex to the vein. Since the case was filed several months ago both litigants have been carrying on extensive work to establish their respective contentions, which consists mainly in making raises to the surface to prove the apex. Incidentally, this work has opened up immense orebodies, some of which were not known before and might never have been found. Noted experts, men of national and international fame, have been engaged by the contestants, and it is expected that the trial of the case will bring out points of great interest to the mining world.

HOUGHTON, MICH.—Sept. 29

No Shutdown Because of 23½c. Price for copper will occur in any of the mines in the Michigan copper district. A number of exploration properties will continue to operate at a loss in the hope that there may be a slight reduction in the cost of their production. But the great majority of properties in and about Houghton will operate to the limit of their capacity which at present is only influenced by the number of men who can be secured for work. There is not much hope of any substantial increase in working forces excepting such temporary increase as comes in the fall and winter following the completion of farm work. Costs at every mine in this district will be higher this year than ever before in the history of Lake Superior mining; this in spite of the fact that there is no construction going forward that is not necessary. Of course, practically all of the substantial companies have added to the number of residences for employees and have expended sums for improvements and repairs on these residences. While these expenditures have come high, the money so paid out came from extraordinary profits made last year. The Calumet & Hecla, for itself and subsidiaries, is going forward with extensive improvements, enlargements and betterments, particularly at Lake Linden. All of this work is of a nature that is necessary and more than pays for itself in the savings brought about. The great mutual plant at Tamarack City is one notable instance of improvements for subsidiaries, as is the new coal dock with its modern equipage. Quincy is completing a large number of new homes, so is Isle Royale. The Copper Range and the Mass companies did some very sensible and practicable work in this line early in the year.

HIBBING, MINN.—Sept. 27

Prices on Ore Leases taken by the Hanna company on Great Northern Ore properties are, it is intimated, on the approximate basis of $1.23 royalty a ton, which is said to be the highest ever paid for Lake Superior iron ore. The U. S. Steel corporation lease on the same properties was on a basis of 84c. a ton. Other leases concluded between 1907 and 1915 range as high as $1 a ton and leases for part of Great Northern Ore lands in 1916 called for a royalty of $1.10 a ton for all ore mined by Butler Bros. on these leases.

JOPLIN, MO.—Sept. 29

No Hope for Better Prices for zinc ore, as a result of activities of the Government Zinc Committee, is longer entertained by local producers. Charles T. Orr, of Webb City, this district's representative on the committee, has unofficially stated that the work of the committee is virtually at an end. Members are understood to have offered their resignations, but Government authorities requested that they continue to act in advisory capacity. While representatives on committee were being criticized in some quarters for recommending a price for spelter higher than it could be obtained in the open market, they were also being criticized in other quarters for naming a price lower than the metal can profitably be produced for, at present cost of ore, labor and supplies. All the work of the committee appears to have been for nothing.

Oronogo Circle Mining Co.'s end was officially recorded here last week when a petition by stockholders for dissolution of the company was favorably acted upon by a local judge. The company is the veteran of the camp and is still a big producer. The change is merely a change in name and the company henceforth will be known officially as the Connecticut Zinc Co., and 179,990 shares were listed in the petition as belonging to this organization. The Logan Trust Co. of Philadelphia holds 120,000 shares, and the remaining ten shares are held by individuals, A. S. Raymond, president and E. Allendorf, treasurer, both of Joplin, having one share each. The company just now is spending approximately $500,000 for a new mill and equipment for conducting opencut mining at its Oronogo, Mo., property.

TORONTO—Sept. 29

Cancellation of Oil-Flotation Patents controlled by Minerals Separation North American Corporation is being urged to prevent curtailment in production. The Minerals Separation North American Corporation has for some time threatened to bring actions for infringement against the Cobalt mining companies using the flotation process. It is alleged that the Minerals Separation corporation is the agent of the firm of Beer, Sondheimer & Co., and that oil-flotation patents are being made use of to promote German interests by restricting the output of metals in Canada. The matter has been taken up by the Toronto "World," owned by W. F. Maclean, M.P., who took a prominent part in the agitation for the prohibition of the export of nickel ore, and is conducting the campaign against the Minerals Separation corporation in much the same strain. However, at a meeting of the Temiskaming Mine Managers' Association, held at Cobalt on Sept. 28, the following resolution was unanimously adopted: "Whereas, the attitude of the Minerals Separation North American Corporation, who claim to control all the basic patents for the treatment of ores by oil flotation, has restricted the output of war metals and retarded the economic development of the mineral resources of this country by claims for unreasonable royalties and by threatened lawsuits, it is hereby resolved that the Temiskaming Mine Managers' Association lend their sympathy and hearty coöperation to The Northern Miner of Cobalt in its endeavor to have the patents and personnel of the Minerals Separation North American Corporation thoroughly investigated by the Government, with a view of having the patents annulled."

[Readers are referred to the statement of the Minerals Separation, North American Corporation, appearing on p. 616, of this issue, respecting the inaccuracies in these Canadian reports—Editor.]

MELBOURNE—Aug. 23

Thames Gold Field, New Zealand, was discovered in July, 1867, so it has now reached its jubilee. At that time the country was in the hands of the Maoris, but arrangements were made for the throwing open of a tract of country for mining purposes. At first the field was worked for the alluvial gold, but it was soon found that the reefs were more valuable. The famous Shotover claim, which in less than 18 months paid each of the four owners £40,000, was discovered on Aug. 13 of that year. Other claims which paid big dividends were the following: Golden Crown, £141,904; Caledonian, £500,000, in its first year; Moanataiari, £117,973; Prince Imperial, £60,750; Cambria, £69,300; Manukau, £15,750; Nonpareil, £14,670; Kuranui, £41,277; All Nations, £41,445; Old Whau, £11,650; and Cure, £17,000. On the first anniversary of the opening of the field its population had grown to 12,000 and 10,582 miners' rights had been issued in respect of 1500 claims, employing 6000 men. The area open for prospecting had been increased to 340,000 acres, of which the claims working occupied 10,000 acres. A total of £80,000 was invested in the mines and £16,000 in battery plants. The annual production has fluctuated considerably, the highest output being reached in 1871 when the value amounted to £1,188,708; for the year 1915 the value was only £30,966, and owing to the failure of the scheme for draining the deep levels its future outlook is uncertain.

The Mining News

ALABAMA

JIRAMA ORE CO. (Gadsden) — Announces uncovering a 15-ft. Irondale ore seam on property at Greasy Cove, near Tumlin Gap.

SHEFFIELD IRON CORPORATION (Sheffield)—Work started on reconstruction of furnaces. Railroad tracks laid and building materials begun to arrive.

TENNESSEE COAL, IRON AND R.R. CO. (Birmingham)—Will erect brick and concrete club house at Wenonah mine, which is the geographical center of the company's holdings in this county.

ALASKA

ALASKA UNITED (Treadwell)—Ready Bullion mine produced in July 8316 tons yielding $16,140; operating expense, $30,010; operating loss, $13,870; construction expense, $4791; net loss, $18,661. The 700 Claim mine produced no ore, 21 tons concentrate being saved from clean up. Ready Bullion had total of 565 ft. development work done, on 450- and 2400-ft. levels; decrease in broken ore stock was 1755 tons.

ARKANSAS

Boone County

ROYAL (Zinc)—H. M. Waddell and Lee Buie, purchased lease on Royal and took possession.

MILLER (Zinc)—J. P. Harvey & Co., composed of J. P. Harvey, Lon Brown and associates, purchased fee in 20 acres from Clyde Miller; will build mill.

MINNIE LEE (Zinc)—R. L. Marler and James Osenborough purchased lease on Minnie Lee in Coon Hollow, and took possession.

RHODES-MANCHESTER (Zinc)—Lease owned by McCurry Mining and Milling Co. Will build small plant. Installing battery of tables at their custom mill at this place.

Marion County

BEN HARRISON (Dodd City)—Under lease to S. T. Peeler and associates. Struck body free lead. Will ship from Pyatt.

ARIZONA

Cochise County

THUNDERBOLDT MINING CO. (Dragoon)—Installing 40-hp. Fairbanks-Morse gasoline hoist; also new headframe.

DRAGOON COPPER LEASE (Dragoon)—Shipped first car this month to smeltery. Finished timbering shaft; sinking for water level.

EMPIRE (Dragoon)—Consists of 190 acres, purchased by Eastern man. Work will commence Oct. 1. Has two-compartment shaft down 280 ft.; at 100-ft. cut vein 5 ft. wide showing good copper ore.

Gila County

MIAMI (Miami)—Labor situation improving gradually, a total force of 900 men working, of which 400 are employed underground. Surface force complete with exception of electricians. Handling 4000 tons daily in five sections of mill which under normal conditions handles 6000 tons in six sections. Production for September was about 2,000,000 lb. copper compared with 250,000 lb. in August. According to report, the Inspiration company refuses to take back any of strikers except Americans and therefore resumption of operations delayed somewhat more than Miami.

Greenlee County

LABOR SITUATION has not improved. Companies' offer to take back all men who reported for work on Oct. 1 resulted in picketing of the district by the union, indicating men would not return. Believed that union leaders encouraging men to hold out until arrival of Commission appointed by President Wilson now en route to Arizona. Commission composed of following: W. B. Wilson, Secretary of Labor; J. H. Walker, former president United Mine Workers; S. D. Marsh, president Washington State Federation of Labor; J. A. Spangler, Pennsylvania coal operator; Berner C. Reed, Colorado capitalist.

Mohave County

SCHENECTADY (Chloride) — Chloride & Telluride Leasing, Mining and Milling Co., opened several feet good ore in South drift, 175-ft. level. Considering installing electric power. Bulkeley Wells, of Colorado, one of principal owners. H. L. Heath, superintendent.

NEW MOHAWK MINING (Chloride)—Face of excellent ore, streaked with ruby silver, about 4 ft. wide, opened in east drift, 150-ft. level of shaft No. 2. Sorting tables being constructed. Shaft No. 3 down 60 ft., opened 8 in. good ore. J. J. Robertson, general manager.

Pima County

DAILY ARIZONA (Tucson)—Control of Daily Consolidated Copper Co. acquired by W. H. Martin and associates of Kokomo, Ind., formerly held by W. H. and J. Daily. Will be reorganized and development resumed under G. S. Hancock, manager.

Pinal County

GILA DEVELOPMENT (Kelvin) — In west drift at first level 3 ft. of ore assaying well in gold recently opened. Shipping ore being sorted.

MAGMA (Superior) — Reported that strike made below 1600-ft. level shows over 12% copper for last 22 ft. Stated that width of vein on 1800-ft. is 30 ft. showing 10% copper; 50 oz. silver; and $1.80 gold.

U. S. VANADIUM (Kelvin)—Harry S. Bryan of Minerals Recovery Co., of Denver, has been in Phœnix demonstrating adaptability of Bryan dry sizing and concentrating appliances. Special stockholders' meeting held to authorize construction of reduction works having 50-ton daily capacity. Property three miles east of Kelvin. E. Payne Plamer, of Phœnix, president.

Yavapai County

CALUMET & JEROME (Jerome)—During week ended Sept. 29, opened in 2-R crosscut same slate formation found in No. 1 containing chalcopyrite. Drifted in 2-R, 25 ft. and started crosscut.

AMULET (Prescott)—General Mining Co. purchased this old property of J. M. W. Brown. Located in 1886; situated few miles east of Howell smeltery on Lynx Creek. New shaft to be sunk 500 ft. and hoist and compressor being installed. Buildings being erected.

CALIFORNIA

Amador County

ALLEN COPPER (Sutter Creek)—Installing air pipe. Jackson men said to be interested in reopening of mine.

SOUTH EUREKA (Sutter Creek)—Reduced force pending repairing and deepening shaft. Low-grade orebodies opened, but desire higher-grade ore.

OLD EUREKA (Sutter Creek)—Enlarging and retimbering shaft reached 1800-ft. point and 250 ft. remains to complete enlargement to three compartments. New electric surface hoist will be exclusively used, leaving underground hoist for emergencies. The 800-, 1200- and 1700-ft. levels have been opened and expose pay ore left by early-day operators. In caved ground in other levels new drifts or crosscuts may be driven instead of reopening old ones.

Butte County

BOSTON (Mokelumne Hill)—Fire which started at this mine has spread into Rich gulch and done large amount of damage; reported to have been checked on Calaveras River. Also reported to have crossed river into Jesus Maria district.

BUTTERFLY (Oroville)—Blue ground formation reported to indicate diamonds. Property is between Cherokee and Oroville Diamond mine within area claimed by M. J. Cooney of Forbestown Consolidated to contain kimberlite. Cooney mined in the South African diamond mines and discovered the Oroville Diamond mine. Diamonds have been found in the vicinity of Cherokee, some in the early days and others in recent years. W. T. Baldwin, R. S. Kittrick and C. F. Belding, of Oroville, are interested.

Calaveras County

BISHOP GRAVEL (Vallecito)—Mark N. Alling, of Downieville, superintendent, and Dwight G. Vedder, assistant, with crew of 10 men, started development of gravel beds on Table Mountain.

PURE QUILL MINING CO. (Angels Camp)—Permitted to issue 20,000 shares capital stock to Fred Bender for assignment of purchase option of mining claims. Also to sell 10,000 shares at $1 per share for cash to be used in development and purchase price.

ANGELS CAMP DEEP (Angels Camp)—Company reorganized. John C. Benson, manager, will go to Oklahoma with Jesse J. Dunn to raise money for development. San Francisco men formerly interested have withdrawn.

Inyo County

SKIDOO (Skidoo)—Mill, pipe line and mine machinery being dismantled and iron and steel shipped to Trona by teams and motor trucks. The mine, once a fine producer, recently abandoned and present price of old iron and steel makes dismantling and shipping attractive. Estimated that 8-in. pipe line will require 160 railroad cars for transportation. Pipe line is 18 miles long and was installed and maintained at large cost to furnish water for stamp mill.

Kern County

RANDSBURG-ATOLIA (Randsburg)—New mill, crusher and concentrator in operation. Mill specially designed by Radcliffe and associates for treating high-grade ores near old Paige property.

Mariposa County

MARIPOSA MINING CO. (Mariposa)—John Kent Kane of New Jersey has brought suit in superior court to recover $8000, value of eight bonds, with interest.

CHAMPION MINING CO. (Los Angeles)—Permitted to issue 675,000 shares capital stock to C. H. White and associates. Contemplate development of property situated on Black Creek, near Coulterville.

Placer County

FOREST HILL DISTRICT active, employing about 100 men. Yukon Gold dredges being dismantled for reconstruction and removal from middle to north fork of American River. Excelsior mine employs 75 men; property worked by R. B. Elder through old Baltimore ground. Spanish Ledge being developed by E. A. Garrison, disclosed chrome- and gold-bearing ore; shipping by motor truck to start in October. Wieland Mining Co. cleaning out 1800-ft. tunnel, to drive into gravel channel.

Plumas County

INDIAN VALLEY R.R. CO. filed application with State Railroad Commission for authority to sell Engels Copper Mining Co., $150,000 of capital stock, proceeds to pay mining company and Western Pacific Ry. certain sums due; to purchase Iron Bar property for terminal uses; to build hotel and cottages at Paxton, a new station at Veramount; and other improvements.

ENGELS COPPER MINING CO. (San Francisco)—Application for permit to issue 167,686 additional shares to be filed. Proposed improvements will include second unit of mill.

San Bernardino County

PHOENIX (Johannesburg)—Stamp mill crushed 200 tons tungsten ore concentrated on Wilfley table in last six weeks.

BUCKBOARD (Randsburg) — Twenty-five tons crushed ore ready for concentration, to be treated when installation of mill completed.

MINNIETTA (Johannesburg)—Two concentrators installed and mining and milling resumed after closing down during July and part of August on account of hot weather interfering with motor-truck and team hauling.

Shasta County

CRAIG INTERESTS said to be preparing for drilling gravel near Igo. William McKee, of Oroville, will be in charge.

NOBLE ELECTRIC STEEL (Heroult)—One furnace in continuous operation producing ferro-mangenese as 80% product. Producing 200 tons per month supplying the Pacific Coast and shipping to Eastern plants. W. H. French, manager.

Siskiyou County

CINNABAR property on west fork of Beaver Creek sold by Cowgil to Boston men at reported price of $40,000. Situated at Garretson Springs to be connected to county road by new wagon and motor road to mine.

Tuolumne County

HALES & SYMONS (Sonora)—Leased to C. E. Rives. Prospect shaft below main working shaft disclosed copper and gold ore of high grade.

KERSHAW (Jacksonville)—Payable ore in slate reported to have unusually uniform contents. Ore shoot said to extend south into Clio.

COLORADO

Clear Creek County

GRAND CLEAR CREEK (Empire)—Daily district mine will resume work.

CONSOLIDATED MINES CO. (Alice)—New compressor installed.

JOSEPHINE (Georgetown)—Mill operating to capacity.

DOCTOR (Empire)—Machinery being installed in mill. Mine in Daily district operated by Argo Leasing Co.

DIVES PELICAN (Silver Plume)—Taken over by Wellington Mines Co., of Breckenridge.

PRIDE OF THE ROCK (Dumont)—Tunnel repaired and will be driven to cut Ohio vein, now in 800 feet.

PRIMOS CHEMICAL CO. will build milling plant at Molybdenum mine in Daily district. Contracts let for lumber; also for building power line from Colorado Power Co.'s main line.

Lake County

BOHN (Leadville)—Mine reopened by lessees. Shaft repaired to 600-ft. level where crosscutting opened large shoot milling-grade manganese ore. Stated, stringers of silver chloride occur, and can be mined separately.

SMALLER PAY ROLL IN LEADVILLE since strike settlement, wages having been readjusted upward. Wages paid are $4.50 for machinemen and $4 for muckers, etc., but in few cases more is paid to best men. Raise caused considerable curtailment in development work and lesser one in production. Stated about two-thirds the number of men now employed as before strike.

La Plata County

DURANGO GIRL (La Plata)—Operated by lessees. Smelting-grade gold-telluride ore shipped.

TENBROECK (La Plata)—Operated by Lewis Mountain Mining Co. Compressor and machine drills installed and new boarding house built. Crosscut tunnel in 600 ft. being driven to cut vein at 1700 feet.

Ouray County

BARSTOW (Ironton)—Lease taken by Engineers' Corporation, of Boulder, Colo., on "Spar" vein; intend to make commercial fluorspar product. Vein cuts main Barstow vein; shows 3 ft. high-grade fluorspar.

Park County

BIG TOAD MINING CO. (Alma)—Operating North Star mine; will install cyanide process.

WEBBER (Alma)—Operated by Metal Mines Development Co. Shipping-grade lead-silver ore produced.

NELSON (Alma)—Developing good-grade lead-zinc ore. Operated under lease and bond; owned by Walker Investment Co., of Denver.

San Juan County

DELANO (Silverton)—Trial shipment to Silver Lake mill.

ASPEN (Silverton)—Small force working; shipping lead-zinc-copper ore.

SILVER LAKE (Silverton)—Portion of workings will be operated under lease by Fred Dillon.

GOLD KING EXTENSION (Silverton)—Contract let to drive tunnel on this Ross Basin property.

VALLEY FORGE (Silverton) — Lease taken and work started. Ore contains lead, zinc and silver.

JOE & JOHN (Silverton)—Property in Dry Gulch being worked by lessees. Shipments to begin soon.

HENRIETTA (Silverton) — Being reopened by Adam & Eve Mining Co. under management of E. W. Palmer.

MEARS-WILFLEY (Silverton)—Mill remodeled and new machinery installed; again treating old tailings from Silver Lake mill.

San Miguel County

BALLARD (Telluride)—Lessees resumed operations at milling plant.

FAVORITE (Ophir)—Being worked by lessees.

LIBERTY BELL (Telluride)—Two electric locomotives installed for lower tunnel.

DUFFY (Ophir Loop)—Being developed by lessees. Crosscut tunnel driven to vein; drifting now under way.

VAN ANDRETT (Telluride)—Vein lead-silver ore opened near Trout Lake; shipment from near surface.

STANDARD CHEMICAL CO. (Placerville)—One 3½-ton motor truck and two four-horse teams employed shipping concentrates to Placerville, whence product shipped East by rail.

CARBONERO (Ophir) — Development resumed under management of G. B. Pickett. Electric power line extended to mine, and compressor operating. Ore opened and shipments will be resumed soon.

TOMBOY (Telluride) — In August mill ran 28 days crushing 12,000 tons, yielding $34,500 bullion. Concentrates shipped amounted to $63,200. Profit was $29,700, expenses amounting to $97,700.

Summit County

BAKER (Breckenridge)—Lessees working 2-ft. vein lead ore.

CONSOLIDATION in Montezuma district of Jumbo, Pennsylvania, Peruvian and Toledo being effected.

MICHIGAN (Kokomo)—Shipping sulphide ore. Tramway may be built from mine to railroad.

ROBINSON MILL (Robinson)—Overhauled and new machinery installed, to treat lead-zinc ore from Michigan mine.

WELLINGTON MINES CO. (Breckenridge)—Shipping lead-zinc concentrates. Crosscutting on sixth level for Great Northern oreshoot.

IRON MASK (Breckenridge)—Tunnel level reopened and repaired for over 1200 ft. Mixed sulphide ore opened in winze below. Formerly producer of lead carbonate ore from upper levels.

Teller County

LEORA (Cripple Creek)—Sold to Victory Gold Mining Co.

ELKHORN (Cripple Creek)—Leasing company operating.

EL PASO (Cripple Creek)—August output by lessees, 530 tons, gold ore.

KOMET LEASING CO. (Cripple Creek)—Shipping from Victor mine.

DILLON (Cripple Creek)—August output 2360 tons. Owned by Granite Gold Mining Co.

CALEDONIA (Cripple Creek)—Reopened by lessees; first shipment of good-grade gold ore made.

PORTLAND (Cripple Creek)—Strike of rich ore on 2000-ft. level from No. 2 shaft; details not available.

NEW BOSTON (Cripple Creek)—Stratton estate property, being worked by lessees. Two-ounce gold ore being shipped from 60-ft. level.

J. H. B. LEASING CO. (Cripple Creek)—Opened shoot of good-grade ore at depth of 50 ft. on Big Banta claim of United Gold Mines Co.

EL PASO (Cripple Creek)—Narrow-gage spur being broad-gaged to No. 1 shaft, and connection made with Midland Terminal railroad. Shipments being made.

AJAX (Victor)—Main shaft recently sunk to 1800-ft. level. Development work on this level has recently opened shoot of good-grade ore. Being worked under lease. W. S. Black, superintendent.

OCEAN WAVE MINING CO. (Cripple Creek)—Incorporated recently; capitalization, $100,000. Controlled by Eastern men; holds long-time lease on Ocean Wave and Little Mary claims, controlled by Portland company.

DIG GOLD MINING CO. (Cripple Creek)—Operating Alpha and Omega claims on Bull Hill; will install machinery and sink shaft from present depth of 100 ft. to 500-ft. level. Good-grade ore opened on first level; shipments will begin soon.

EXCELSIOR (Cripple Creek)—Operating Longfellow mine of Stratton estate under lease. Shaft 400 ft. deep will be sunk by contract to 600-ft. level. Connection will be made on 500-ft. level with Golden Cycle. Extraction of ore to begin as soon as shaft work completed.

IDAHO

Shoshone County

PINE CREEK R.R. has started construction work; expected that track will be laid by January. One new mill, the Nabob (Stewart), and probably two more, the Northern Light and Amy & Matchless, will be constructed in spring. Highland-Surprise and Constitution mills already operating.

YUKON GOLD (Murray)—Has about completed reconstruction of 7½-cu.ft. dredge, formerly used in Alaska. Electric power line expected to be completed by middle of October and dredging will continue during winter.

FEDERAL (Wallace)—Announced that Federal Mining and Smelting Co. purchased Independence lead mine near Ketchum, in South Idaho. Is old producer, closed down for several years on account of litigation. Is second property Federal has bought in district, first being North Star.

DOUGLAS (Beeler) — Announcement of dividend of 1c., Oct. 1—second disbursement—represents accumulation of royalty paid by the Anaconda company operating the Douglas under lease. Amount of each payment is $8500. Shipments resumed after interruption of few weeks on account of closing of Anaconda's works.

MIDNIGHT (Mullan)—Recently bonded by eastern men represented by Robert Sweeney; reincorporated as the Early Dawn Mining Co. Practically surrounded by Federal company's ground and No. 5 tunnel of Morning mine cut its vein years ago, showing body of lead ore. Since bonding drifts run both east and west from Morning tunnel show oreshoot averaging 8 ft. in width. Raise being made to explore vein to surface.

MICHIGAN

Copper

KEWEENAW (Calumet)—Losing men to big towns and mill not running to capacity.

FRANKLIN (Demmon)—September tonnage about 26,550 tons.

ISLE ROYALE (Houghton)—September tonnage 64,000 as against 73,000 for August.

NEW BALTIC (Houghton)—Management confident new lode, still showing rich copper, is the new Arcadian.

VICTORIA (Victoria)—Short of labor of all kinds especially surface men. September production about 100 tons mineral. Mill improvements completed in two weeks.

SENECA (Calumet)—Piers for shaft house constructed. Boilers and hoist secured but not yet delivered. Hope to have plant under cover before snow flies.

HOUGHTON (Houghton)—Closed temporarily Sept. 28; will place part of force on the 19th level of Superior drifting to boundary to explore Superior lode and West Vein.

QUINCY (Hancock)—Electric haulage on all long hauls using storage battery locomotives and overhead trolleys; latter about half as expensive as former, but carry with them danger of electrocution.

HANCOCK (Hancock)—Shipping 1100 tons daily, 26,400 for September, 700 from Quincy shaft No. 7, and 400 from Hancock No. 2, an increase of 250 tons daily over August, as more men have been taken on.

OSCEOLA (Osceola)—Sub-shaft, in 1800 ft. on 45th level, has track laid to 46th; hoisting a rock car in cage to 45th where rope haulage pulls it to No. 6 shaft. Every lower level south shows continuation of good ore.

WHITE PINE EXTENSION (Ontonagon) — Underground showing continues good. On 1800 ft. of openings on first level, copper from 17 to 42 lb. per ton shown. No additional financing necessary for a year.

WHITE PINE (Ontonagon)—With flotation secures 27 lb. of copper out of rock that carries 30; highest recovery in Lake Superior district. Flotation not in use on all tailings, but will be when tanks can be put in.

SOUTH LAKE (Houghton)—Has five crosscuts, one each on surface, third, fourth, fifth and sixth levels. All showing up fairly well. Only new one is the surface crosscut in progress for 90 days. Shipments are good grade and could be increased if more men were available. No assessment contemplated at present and financial condition is dependent upon price of metal and securing more rock.

MINNESOTA

Mesabi Range

HARTLEY (Chisholm) — Shipments stopped. Entire crew switched to stripping which will continue throughout winter.

CAVOUR (Kinney) — Stockpiles being shipped this year by Hartley interests, of Duluth, former operators.

STEVENSON (Stevenson) — Contracted with J. Dawson, of Hibbing, for scramming portion of pit and loading ore into cars by means of small steam shovel.

HANNA ORE CO. (Chisholm)—Will produce close to 400,000 tons this season from this district. Will do development work this winter.

MIDGET (Hibbing)—Large crew of men scramming ore from under banks so that it can be loaded by steam shovel into cars. C. Richards, superintendent.

MESABA MOUNTAIN (Virginia)—Large 300-ton Bucyrus steam shovel being set up in pit by Oliver company to remove overburden this winter; first large shovel used by this company.

MISSOURI

Joplin District

BLUE MOUND (Baxter, Kan.)—Started construction of second mill, the Blue Diamond, immediately west of present plant.

WOODCHUCK (Commerce, Okla.)—Lost hoist room by explosion. Only property damaged. Cause unknown.

COMMERCE (Miami, Okla.)—Building mill, the Webber, of 250-ton capacity per shift in Kansas, just north of Blue Mound mine.

VINEGAR HILL ZINC (Baxter, Kan.)—Installing two new jigs and doubling capacity of Barr mine. Opening rich second level run at 210 ft.

ST. JOE (Joplin)—Substituting steam pumps for electric pumps at new mine at Picher, Okla. Mill recently completed and first nine-hour run produced 42 tons zinc concentrates, a yield of 26%.

IMPERIAL (Joplin)—Sinking mill shaft to 225 ft. at property just north of Cave Springs. Mill supplied from two field shafts. Ore face 75 ft. thick. Budd M. Robinson, Joplin, owner.

LUCKY JACK (Baxter, Kan.)—Started 400-ton mill operating. Mining at 90-ft. level; will sink shaft to 200 ft. Main ore run indicated by drilling at 150 to 200 ft. G. K. Williams, Farmington, Mo., principal owner.

LUCKY STRIKE LEAD AND ZINC (Quapaw, Okla.)—Bought mill at Porto Rico and will move to lease just north of Quapaw, where company secured rich drill holes. Will enlarge 200-ton mill to 300 tons. R. L. Austin, Miami, Okla., president.

ACME LEAD AND ZINC (Picher, Okla.)—Building No. 2 mill on west portion of 40-acre lease of Walker land. Will be electrically equipped with 250-ton capacity per shift. Operations at 165-ft. level. J. A. Wingfield, Webb City, manager.

KANSOURI (Baxter, Kan.)—Constructing mill on lease, west of Baxter in Blue Mound territory, 30 drill holes, having shown ore. Mill to be of 350-ton capacity. Mining at 240-ft. level. C. B. Boylan, Miami, Okla., president.

TENNESSEE LEAD AND ZINC (Joplin)—With drills, has discovered another rich ore run at old Yellow Jacket property at Klondike, Mo. For several months has been making bonanza profits with 100-ton mill. R. H. Allen, Joplin, manager.

MAHUTSKA (Picher, Okla.)—New 250-ton mill operating. Ore taken from two shafts from one of which yield has been 25% since starting Sept. 6. Making about 25 tons concentrates daily with mill operating one shift. R. Y. Ramage, principal owner. W. L. Kepner, Joplin, superintendent.

MONTANA

Jefferson County

BOSTON & CORBIN (Corbin)—Annual report for year ended July 31, 1917, shows 36,910 tons ore mined (all from Bertha property), yielding 8945 tons of concentrates, containing 810,677 lb. copper and 48,254 oz. silver. Cost of production was 25.564c. per lb. of copper and price received was 29.512c. per lb. Development was started on 900-ft. level and toward Corbin vein in 1202 crosscut in November. Development cost averaged 2.038c. per lb. of copper produced. Crosscut over 1200 ft. on 1200-ft. level to explore Corbin vein at depth; future of property depends to great extent on results obtained.

Lewis and Clark County

AMERICAN SMELTING AND REFINING (Helena)—The second largest brick stack in the United States has just been completed. It is 400 ft. high, 24 ft. in diameter at base and 16 ft. at top. Erected in 46 days. Expected to mitigate smoke nuisance and save metals heretofore passing off in fumes.

Musselshell County

TRI-CITY OIL CO. (Roundup)—Oil struck at 1700 ft. in well in Crazy Woman's Pocket Basin, west of here. On account of flow of water unable to tell importance of strike.

Silver Bow County

NORTH BUTTE (Butte)—Two more damage suits, each to amount of $10,000, filed by administrators of estates of Patrick Shields and Daniel Kennedy, victims of fire in Granite Mountain shaft on June 8.

ANACONDA (Butte)—Hoisted 11,000 tons on Sept. 29 and 9800 on Sept. 25, against normal of 17,000. Reported that there were 7400 underground workers in Anaconda mines on Sept. 29. Training all men in corps of mining engineers in use of the gas helmet since Sept. 20. Expected to increase efficiency of the safety-first department as engineers will hereafter be able to give information about underground workings as well as render assistance in rescue work.

NEVADA

Clark County

BULLION (Goodsprings)—Shipped 20-ton carload, lead-silver ore recently, receiving $2001. Another carload shipped Aug. 26 and another in readiness. Putting auxiliary mill in shape for operation. J. J. Daynes, Jr., president and manager. General office, 61-3-5 Main St., Salt Lake City, Utah.

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 22 was 9388 tons, valued at $164,290, comparing with 9521 tons the previous week. Producers were: Tonopah Belmont, 2445 tons; Tonopah Mining, 2400; Tonopah Extension, 2380 tons; Jim Butler, 750 tons; West End, 905 tons; Montana, 71 tons; Rescue, 191 tons; North Star, 54 tons; Midway, 94 tons; Cash Boy, 40 tons.

UNION AMALGAMATED (Manhattan)—Discontinued third shift to permit ventilation of workings. Water in Mushelt oreshoot decreased and development resumed. North crosscut advanced 14 ft. to footwall shows 2 ft. ore next hanging wall. East drift from No. 7 crosscut encountered broken up limestone but face now in milling ore. South crosscut on Earl fault shows free gold; hanging wall side in heavy shale formation requiring close timbering.

WHITE CAPS (Manhattan)—Hanging wall crosscut No. 5 cut White Caps fault and drifting started. South crosscut driven off east drift through limestone to cut downward extension of pipe of ore developed by last raise. Raise No. 405 from 400-ft. level, now up 114 ft. in good grade milling ore. From fifth level, south crosscut driven 197 ft. in limestone for 45 ft. and expect to encounter east orebody within few feet. Hoisting 100 tons, after sorting limestone, per day.

NEW MEXICO

Grant County

EL PASO MINING (Pinos Altos)—Working on Pacific No. 2 shaft on Skilacorn vein encountering high-grade gold ore; also developing low-grade tonnage. Using Huff electro-static separator and flotation.

CALUMET NEW MEXICO (Pinos Altos)—Expect to erect first 40-ton unit of mill shortly using tables and flotation. Shipping to smeltery at Coffeyville, Kan. Receive no returns for 0.50 oz. gold, 10 oz. silver and ½% copper content of its lead-zinc ore from smelters. Mine development well advanced. J. A. McCallum, superintendent. Head office, 154 W. Randolph St., Chicago.

OREGON

Baker County

HOMESTEAD GROUP (Homestead)—W. S. Kuhn of San Francisco, purchased this group of copper claims from W. B. Macdougall. Situated near here on Snake River. Sale price was $125,000. Negotiations being made for extension of power line from Idaho Power Co.'s terminal at Homestead. W. S. Kuhn, in charge.

Josephine County

J. M. FINCH and T. P. Johnson taking out chrome ore near Kerby, and will ship soon.

HOME (Waldo)—Assays from lower levels of this gold mine on Monkey Creek encouraging reopening. J. N. Britten, manager.

UTAH

Salt Lake County

UTAH COPPER (Bingham)—Will receive refund amounting to $43,750 payable in 30 days on protested taxes paid in 1913-1914. Less than amount asked by company but finally agreed to by attorney for mining company and county commissioners.

MONTANA-BINGHAM CONSOLIDATED (Bingham)—Three cars of concentrates from Fortuna workings shipped week ended Sept. 7. Machinery ordered for second unit. Tunnel reached Fortuna fissure; drifting to be started here, and raising done to workings 1400 ft. higher.

Tooele County

WEST TOLEDO MINES (Sells)—Situated in Cottonwood district. Machine drills being installed for exploring Manitoba fissure, 1500 ft. long showing mineralization. Expect to strike Toledo fissure dipping 60 deg. to north within 150 ft. Embargo almost completely lifted and mine shipping three or four cars good ore per week.

Summit County

DALY WEST (Park City)—August shipments were 1700 tons crude ore and concentrates. Mill stated to be treating 200 tons daily, running from 3 to 8% lead and 5 to 10 oz. silver.

Utah County

ETTA MAY (American Fork)—Tunnel in about 25 ft. reported to show 2½ ft. ore.

WISCONSIN

ZINC-LEAD DISTRICT

M. & A. (Platteville)—Churn drilling indicated good zinc orebody on Rundell land, at Rewey.

HARKER (Plattville)—Joseph Pickett and others are sinking shaft on this tract at Big Patch.

WISCONSIN ZINC (Platteville)—Construction of 200-ton mill and sinking of new shaft commenced at Shullsburg.

GREAT WESTERN (Galena, Ill.)—This property, dividend payer in 1914-15, opened up again. Robert Banes, manager.

CANADA

Ontario

ORE SHIPMENTS from Cobalt over Temiskaming & Northern Ontario Ry., as reported by Arthur A. Cole, mining engineer, for August were: Aladdin Cobalt, 78 tons; Beaver, 42; Buffalo, 62; Coniagas, 78; Crown Reserve, 20; Dominion Reduction Co., 214; Hudson Bay, 44; Kerr Lake, 150; La Rose, 131; Mining Corporation of Canada, 32; McKinley-Darragh, 129; National, 23; Nipissing, 656; O'Brien, 54; Temiskaming, 62; total 1777 tons from Cobalt proper; Miller-Lake-O'Brien (Elk Lake), 34 tons; Alexo mine (Porquis Junction) 520 tons nickel ore.

HAYDEN (Porcupine)—Arrangements being made for diamond-drilling.

DOME (South Porcupine))—Operations curtailed by labor shortage.

SCHUMACHER (Schumacher)—During last month treated approximately 3400 tons ore, recovering $23,000.

ROGNON (Dryden)—Nissen stamp mill installed and little gold bullion produced. Workings at depth of 70 ft.

KIRKLAND PORYPHYRY (Kirkland Lake)—Sinking at rate of 3 ft. per day encountering visible gold. Equipment arriving.

LE HEUP (Gowganda)—Acquired by interests identified with the McIntyre and Boston Creek mines. Mining plant is being sent in.

HURD (Kirkland Lake)—Taken over by New York men. Company being organized for $15,000,000, known as Ontario Kirkland Gold Mines.

NATIONAL (Cobalt)—Flotation plant treating average of 100 tons per day. Arrangements made for resumption of underground work, suspended since July 1.

CASEY COBALT—Work on new mill to replace that destroyed by fire delayed by labor shortage. Large quantity of low-grade on dump which can be handled profitably with mill.

TECK-HUGHES (Kirkland Lake)—Mill treating 80 tons per day. Winze sunk from 400-ft. level to 550 ft. Good-grade milling ore approximately 30 ft.; one shoot about 520 ft. long.

PROVINCIAL (Cobalt)—Work rapidly pushed on mill extension; mine inspected by Americans including John T. Milliken, St. Louis; Frank G. Logan and Joseph P. Griffin, of Chicago, George E. Pierce, Buffalo.

MEXICO

PARAFFIN DISCOVERY in Chihuahua near American line was announced in dispatches from Mexican Government according to El Paso report. Said to be traceable on surface for six miles.

MEXICAN GOVERNMENT after Oct. 1 will refuse to accept American bills, silver coin or drafts on the United States in payment of Federal taxes and duties. Reason given is that American Government prohibited export of gold. American gold coin will be accepted at rate of two to one. If ore or concentrates are exported which contain more than six grams of gold per ton, exporters must import equal amount in refined form. If silver is exported in bars, or in ores and concentrates containing more than 50 grams per ton, the exporters must import 25% of value in gold bars or gold coin at price to be fixed by Treasury Department.

SOUTH AFRICA

MINERS UNION at meeting of special delegates, resolved, according to a Reuter dispatch, to accept minimum wage offer made by Chamber of Mines subject to agreement regarding certain passages. Also accepted 48½-hour week, "bank to bank" as from Jan. 1, 1918, and additional war bonus from Sept. 1. Offer to establish employment bureau was declined.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
27	4.7550	101⅛	51½	1	4.7530	95⅛	48½
28	4.7550	97⅛	49½	2	4.7530	93⅛	47½
29	4.7550	96⅛	49	3	4.7530	93⅛	47½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept. Oct.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
27	23½	61½	7⅞ @8 7⅞	7⅞ @7.90 7¾	8⅛ @8⅛ 8.05
28	23½	61	@8	@7.90 7.80	@8.15 8⅛
29	23½	61	8	@7.90 7.80	@8⅛ 8⅛
1	23½	60½	8	@7.90 7.80	@8⅛ 8⅛
2	23½	60½	8	@7.90 7.80	@8⅛ 8
3	23½	60⅜	8	@7.90	@8⅛

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Beginning with Sept. 21, we quote the price fixed by the U. S. Government.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Sept. Oct.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
27	110	110	130	246	243	30½	54
28	110	110	130	245½	242½	30½	54
29							
1	110	110	125	243½	241½	30½	54
2	110	110	125	243½	241½	30½	54
3	110	110	125	244½	242	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

NEW YORK—Oct. 3

In copper there is, of course, no longer anything but the market arbitrarily established by the Government, barring transactions in small lots that are in the hands of dealers. The tin and zinc markets were very dull this week. In lead, however, transactions attained a considerable volume.

Copper—There is no longer any free market in copper, the situation being practically in the hands of the Government, which has arbitrarily established the price. During this week requisitions for copper were made. However, producers do not yet have any idea about the aggregate that is going to be demanded, and meanwhile they are refusing to supply domestic consumers at all and are resisting all importunities. Producers will not even consider business for delivery after next January, although consumers have made overtures for such business.

On Sept. 28, the producers held a meeting in New York, at which all were represented, and formed a new Copper Producers' Committee, whereof Mr. Clendennin was elected chairman, and the other members are Messrs. McLean, Agassiz and Wolfson, while Hamilton Brush is secretary. This committee has taken an office at No. 60 Broadway. The committee will collect the necessary statistical information and will attend to the distribution of copper with the object of giving preference to governmental requirements.

On Oct. 2, the principal copper consumers held a meeting in New York and formed a committee to represent them, Mr. Brooker, of the American Brass Co., being elected chairman, and Mr. Howard, of the National Conduit and Cable Co., secretary. The producers' committee met the consumers and explained to the latter the situation that exists in respect to shortage of copper, and informed the consumers that they will have to get along with a curtailed supply and stated that it would be an object of the producers' committee to treat all consumers fairly.

Eugene Meyer, Jr., who has been attending to details of the purchase of copper, lead and zinc under Mr. Baruch, of the War Industries Board, has left that place in order to assist Mr. Vanderlip in the financial work that he has undertaken. No successor to Mr. Meyer, on the War Industries Board, has yet been appointed, so far as we know.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—This market was very narrow and there was but little change in prices. At the close, Straits tin was quoted at 60⅝c. and Banka at 59⅜c.

Deliveries of Banka tin in Holland are reported by Messrs. De Monchy & Havelaar of Rotterdam at 645 tons; for the seven months ended July 31 at 5735 tons. Stocks in the hands of the Netherlands Trading Co. July 31 were 1030 tons.

Lead—After a little weakness early in the week, when prices were shaded, a large volume of business was done at the full price. The domestic transactions reported to us were upward of 3000 tons. Besides these, there was sold a large tonnage for export, orders being taken for many parts of the world. The nature of the business of the week tends to confirm previous conjectures that the lead market has temporarily come into equilibrium around 8c. However, there is no doubt that unsold stocks are beginning to accumulate. That is a matter for congratulation, for it indicates a return of the lead market to natural conditions, which cannot be said to exist in any market in the absence of a reasonable stock. Since the recent labor troubles were overcome, production has been increasing, while on the other hand consumption has been decreasing right along by virtue of strangulation, owing to high prices.

Zinc—This market continued to be dull and sluggish, with but little change in price.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Other Metals

Aluminum—The dullness in this metal continued, No. 1 ingots at New York being quoted at 40@42c. per pound.

Antimony—This market continued dull and was a shade easier. We quote 15¼c. for spot and 15¼@15½c. for futures, c.i.f., in bond.

Cadmium—This metal is quoted at $1.40 @1.50 per pound.

Bismuth—Unchanged at $3.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—This market was quiet and lower. We quote $105. San Francisco reports, by telegraph, $104, market easy.

Gold, Silver and Platinum

Gold—The government of India has prohibited the importation of gold except by special license. The government will itself take possession of all gold imported, paying therefor at the standard rate.

Silver—Owing to cessation of China buying and liquidation of speculative holdings silver has had a sharp reaction, but is more steady at today's London quotation, 47½d.

Mexican dollars were quoted in New York, Sept. 26 at 84c.; Sept. 27 at 79c.; Sept. 28 at 75c.; Sept. 29 at 75c.; Oct. 1 at 73c.; Oct. 2 at 71 cents.

Platinum—The market is variously characterized as fair to good. We quote it unchanged at $103@105.

Palladium—There was a brisk demand for this metal at $125, which was paid, and which we quote, but large users are averse to paying so high a price and are offering to give only $110, hoping that the market will come down to their figure.

Zinc and Lead Ore Markets

Joplin, Mo. Sept. 29—Blende, per ton, high $77.60; basis 60% Zn, premium $75; medium to low $70@65; calamine per ton basis 40% Zn, $38@30; average selling price, all grades of zinc, $63.33 per ton. all grades of lead $86.22 per ton.

Shipments the week: Blende 8048 tons, calamine 460 tons, lead 858 tons. Shipments 9 months: Blende 350,750 tons, calamine 31,240 tons, lead 58,664 tons. Value, all ores the week, $612,810. Value, all ores 9 months, $33,955,820. Increase over nine months last year: Blende 97,537 tons, calamine 11,402 tons, lead 14,316 tons.

Sellers were more prompt to accept price offerings this week, and a larger tonnage was purchased for next week's delivery. The car shortage keeps ore from moving in a southern direction just now. Shortage of help in the mines becomes more noticeable as drafted men are withdrawn, and electric power trouble is cutting out some mines.

Corrected prices of lead ore for week ended Sept. 22 are sent by our Joplin correspondents as follows. Lead, high $93; basis 80% Pb, $90; average selling price, all grades of lead, $82.48 per ton.

Platteville, Wis., Sept. 29—Blende, basis 60% Zn, reduced to $67.50 base for premium ore down to $63 base for medium grade. Lead ore, basis 80% Pb, $80 per ton. Shipments reported for the week are 3017 tons of zinc ore, and 450 tons of sulphur ore. For the year to date the figures are: 107,267 tons of zinc ore, 5016 tons of lead ore, and 20,890 tons of sulphur ore. Net zinc shipment from the district increased 13,331 tons over figures for the corresponding period of 1916; the gross zinc shipment delivered from mines increased 22,752 tons; lead ore increased 1741 tons; sulphur ore decreased 2112 tons. Shipped during week to separating plants, 3572 tons.

Other Ores

Manganese Ore—Unchanged at $1 per unit on the basis of 48% manganese.

Molybdenum Ore—Unchanged at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Tungsten Ore—Considerable business was done. We quote high-grade wolframite unchanged at $23@25 and scheelite at $26. Low-grade wolframite was reported offered at $19.

Pyrites—Spanish lump quoted at 15c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and

any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 40s. also offered for Pensacola, Fla.—slightly lower than previous Gulf charters.

Iron Trade Review

PITTSBURGH—Oct. 2

Scarcely any business has been done in the iron and steel commodities for which prices were fixed a week ago yesterday. There have been efforts to buy for early deliveries, but as producers are well sold up they are indisposed to entertain such inquiries, and as for forward deliveries, there is no disposition to buy as no delivery promise could possibly be made. All shipments of steel are under the jurisdiction of the Priority Board, so that even those who have already bought do not know when shipment will occur.

A series of meetings starts today for the purpose of developing a schedule of prices on billets, sheet bars, wire products, tubular goods, sheets, etc., for submission to the War Industries Board. In accordance with the understanding reached, these prices are to be in harmony with the prices already fixed, basic and foundry pig iron at $33, valley, and bars at 2.90c., shapes at 3c. and plates at 3.25c., Pittsburgh and Chicago. Such prices as are approved will be announced at Washington under authority of the War Industries Board, but no additional prices need be expected in less than a week. This will not complete the program by any means, since it has been announced at Washington that prices are to be fixed on about 150 articles in steel.

Pig Iron—There is some inquiry in the market for foundry iron, both for the fourth quarter of this year and for the fore part of next year, but as furnaces are well sold up they are indisposed to quote. Higher prices would be bid for small prompt lots than those now fixed, but merchants and consumers who might be able to spare some iron are indisposed to quote as while technically they are not bound by the agreement between the Government and the producers they feel that the proper thing is not to sell except at the fixed price and naturally they would not part with iron on that basis. We quote basic, No. 2 foundry and malleable at $33, valley, the price fixed, and bessemer tentatively at $36.30. Messrs. W. P. Snyder & Co. report their computations of average prices realized on all shipments of valley iron in September at $45.45 for bessemer and $41.34 for basic, or $7.77 decline for bessemer and $8.08 decline for basic from the August averages. The average quoted price of foundry iron in September was $47.68, this including the fixed price of $33 beginning Sept. 25. All averages are at valley furnaces, prices delivered Pittsburgh being 95c. higher.

Steel—A sale is reported of 1000 tons of billets for prompt shipment at $60. The fixed price is not out yet, but will probably be about $50. As offerings would doubtless be light at the fixed price, it is significant that consumers are not making an effort to buy at the higher prices producers would be justified in charging in the interim. There is some talk of setting sheet bars at $5 above billets instead of the old spread of $1.

Ferroalloys

Ferromanganese—The market has been extremely quiet. There are prospects that the Government will endeavor to fix a price on ferromanganese, and if so it will probably be lower than prices lately quoted, and at which there has been scarcely any demand. We quote prompt at $375 and first half on contract at $350, freight allowed.

Coke

Connellsville—There is nothing new in the matter of Government regulations, there being simply the $6 price set yesterday week. A differential for foundry coke will doubtless be established, but it seems improbable that dealers or brokers will be allowed to charge an extra price, being expected to get their commission, if any, from the producer. A little spot business has been put through, but not much, as producers have been shipping heavily on their contracts, at prices above the fixed level, and have also been shipping heavily on some short term sales. Offerings are expected to be much larger in the near future. There will be much more free coke to the end of the year than in 1918, as many 1918 contracts were made recently for the year without providing for the interim period. We quote furnace and foundry coke, spot or contract, at $6 per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 2
Alaska Gold M	4⅛
Alaska Juneau	3
Am.Sm.& Ref.,com.	97
Am. Sm. & Ref., pf.	107
Am. Sm. Sec., pf., A	95
Am. Sm. Sec., pf. B	‡93
Am. Zinc	17⅛
Am. Zinc, pf.	54
Anaconda	71
Batopilas Min	1⅛
Bethlehem Steel	95
Bethlehem Steel, pf.	91
Butte & Superior	24⅛
Cerro de Pasco	32⅛
Chile Cop	17⅛
Chino	50
Colo.Fuel & Iron	43⅛
Crucible Steel	73⅛
Dome Mines	8⅛
Federal M. & S.	18
Federal M. & S., pf.	44
Great Nor., ore ctf.	33⅛
Greene Cananea	41
Gulf States Steel	97
Homestake	102
Inspiration Con.	49⅛
International Nickel	32⅛
Kennecott	38⅛
Lackawanna Steel	81⅛
Miami Copper	33⅛
Nat'l Lead, com.	50⅛
National Lead, pf.	104
Nev. Consol	20
Ontario Min	5⅛
Quicksilver	1⅛
Quicksilver, pf.	1⅛
Ray Con	24⅛
Republic I.&S.,com.	82⅛
Republic I. & S., pf.	100⅛
Sloss-Sheffield	45
Tennessee C. & C.	14⅛
U. S. Steel, com	110⅛
U. S. Steel, pf.	117
Utah Copper	91
Va. Iron C. & C.	59

N. Y. CURB†	Oct. 2
Big Ledge	1⅛
Butte & N. Y.	1
Butte C. & Z.	8⅛
Caledonia	.64
Calumet & Jerome	2⅛
Can. Cop. Corpn	2
Carlisle	4
Cashboy	.07
Con. Ariz. Sm.	1 1/16
Con. Coppermines	9⅛
Con. Nev.-Utah	⅛
Emma Con	.75
First Nat. Cop.	2⅛
Goldfield Con.	.39
Goldfield Merger	.05
Greenmonster	⅛
Hecla Min.	8⅛
Howe Sound	5
Jerome Verde	1 3/16
Kerr Lake	5⅛
Louisiana	⅛
Magma	48
Majestic	.38
McKinley-Dar-Sa.	.58
Milford	1 1/16
Mohican	⅛
Mother Lode	.35
N. Y. & Hond.	13
Nipissing Mines	8⅛
Ohio Cop.	1⅛
Ray Hercules	3⅛
Richmond	.58
Rochester Mines	.52
St. Joseph Lead	17⅛
Standard S. L.	⅛
Stewart	⅛
Success	.19
Tonopah	6⅛
Tonopah Ex.	1 1/16
Tribullion	.15
Troy Arizona	.16
United Cop.	.68⅛
United Verde Ext.	36
United Zinc	3⅛
Utica Mines	.21
White Knob, pf.	‡1⅛
Yukon Gold	2

SAN FRAN.*	Oct. 2
Alta	.03
Andes	.10
Best & Belcher	.02
Bullion	.01
Caledonia	.10
Challenge Con.	.01
Confidence	.05
Con. Virginia	.16
Gould & Curry	‡.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.08
Mexican	.05
Occidental	.60
Ophir	‡.09
Overman	.05
Savage	.03
Seg Belcher	‡.02
Sierra Nevada	.15
Union Con.	.61
Utah Con.	.01
Belmont	4.50
Jim Butler	.87
MacNamara	.27
Midway	.11
Mont.-Tonopah	.18
North Star	.09
Rescue Eula	.17
West End Con.	.68
Atlanta	.08
Booth	.05
Comb. Frac.	.03
D'field Daisy	.02
Florence	.14
Jumbo Extension	.18
Kewanas	.06
Nevada Hills	.12
Nevada Packard	.22
Round Mountain	.25
Silver Pick	.13
White Caps	1.35
Big Jim	.62½
United Eastern	4.20

BOSTON EXCH.*	Oct. 2
Adventure	1⅛
Ahmeek	97
Algomah	.45
Alloues	62⅛
Ariz. Com., ctfs.	11
Arnold	.25
Bonanza	.21
Butte-Balakiava	.40
Calumet & Ariz.	75
Calumet & Hecla	525
Centennial	15⅛
Copper Range	54⅛
Daly West	1 1/16
Davis-Daly	5
East Butte	11⅛
Franklin	5⅛
Granby	78
Hancock	12
Hedley	‡17
Helvetia	‡.25
Indiana	‡1⅛
Isle Royale	30
Keweenaw	‡1⅛
Lake	‡10
La Salle	‡3
Mason Valley	‡6⅛
Mass	9⅛
Mayflower	2
Michigan	2
Mohawk	80⅛
New Arcadian	2⅛
New Idria	11
North Butte	16
North Lake	‡.95
Ojibway	‡1⅛
Old Dominion	46
Osceola	‡88
Quincy	84
St. Mary's M. L.	70
Santa Fe	1⅛
Seneca	‡7
Shannon	6⅛
Shattuck-Ariz.	‡24
So. Lake	‡3
So. Utah	.22
Superior	8
Superior & Bost.	‡3⅛
Trinity	6
Tuolumne	1⅛
U. S. Smelting	61
U. S. Smelt'g, pf.	49⅛
Utah Apex	3⅛
Utah Con.	15
Utah Metal	3⅛
Victoria	3
Winona	2⅛
Wolverine	40
Wyandot	‡.80

BOSTON CURB*	Oct. 2
Alaska Mines Corp.	.37
Bingham Mines	11⅛
Boston Ely	.70
Boston & Mont.	.61
Butte & Lon'n Dev.	.14
Calaveras	2⅛
Calumet-Corbin	.01
Chief Con.	2⅛
Cortez	.10
Crown Reserve	.26
Crystal Cop.	.78
Eagle & Blue Bell	2⅛
Houghton Copper	.75
Intermountain	1⅛
Iron Cap, Com.	15⅛
Iron Cap Cop., pf.	15⅛
Mexican Metals	.27
Mines of America	1⅛
Mojave Tungsten	.50
Nat. Zinc & Lead	.35
Nevada-Douglas	1⅛
New Baltic	1⅛
New Cornelia	16⅛
Oneco	.40
Pacific Mines	.35
Rex Cons.	.15

SALT LAKE*	Oct. 2
Bannack	.26
Big Four	.00⅛
Cardiff	3.00
Colorado Mining	.15
Daly	1.70
Daly-Judge	8.45
Empire Copper	1.27⅛
Gold Chain	.16
Grand Central	.55
Iron Blossom	.89
Lower Mammoth	.03
May Day	.03⅛
Moscow	.11
Prince Con.	.12
Silver-King Coal'n	3.10
Silver King Con.	3.97⅛
Sioux Con.	.06
So. Hecla	.97
Tintic Standard	1.47⅛
Uncle Sam	.04
Wilbert	.25
Yankee	.06⅛

TORONTO*	Oct. 1
Adanac	.17
Bailey	.05
Beaver Con.	.38
Chambers Ferland	.12
Coniagas	3.80
Hargraves	.11
La Rose	.50
Peterson Lake	.11⅛
Right of Way	‡.05
Temiskaming	.34⅛
Wettlaufer-Lor.	.07
Dome Exten.	.13
Dome Lake	.14
Foley O'Brien	‡.60
Hollinger	5.10
McIntyre	1.40
Newray	.68
Porcu. Crown	.40
Schumacher	‡.42
Teck-Hughes	.40
Vipond	.25
West Dome	.16

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Oct. 2
Cresson Con.	5.50
Doctor Jack Pot	.03⅛
Elkton Con.	.04⅛
El Paso	.20
Gold Sovereign	.03⅛
Golden Cycle	1.98
Granite	.40
Isabella	.09⅛
Mary McKinney	.06⅛
Portland	1.44
United Gold M.	.16
Vindicator	.50

LONDON	Sept. 13		
Alaska Mexican	£0	5s	0d
Alaska Tre'dwell	1	0	0
Burma Corp.	4	0	0
Cam & Motor	0	11	0
Camp Bird	0	8	0
El Oro	0	10	9
Esperanza	0	10	3
Mexican Mines	6	0	0
Nechi, pfd.	0	13	3
Oroville	0	17	0
Santa Gert'dis.	0	12	3
Tomboy	0	18	6

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.066	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	85.407	22.780	31.498	43.418
September	48.680	68.515	100.74	23.591	32.584	50.920
October	49.385	67.855	.....	23.925	32.361	.....
November	51.714	71.604	.....	25.094	34.192	.....
December	54.971	75.765	.....	26.373	36.410	.....
Year	49.684	65.661	.....	23.675	31.315	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	25.073	113.905	117.500	134.071	135.250
Oct.	27.193	.....	122.750	.....	142.523	.....
Nov.	30.625	.....	134.659	.....	155.432	.....
Dec.	31.890	.....	145.316	.....	162.842	.....
Year	27.202	.....	116.059	.....	138.281	.....

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	61.542	171.345	244.038
October	41.241	.....	179.307	.....
November	44.109	.....	186.932	.....
December	42.635	.....	183.368	.....
Av. year	43.480	.....	182.096	.....

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	8.680	6.699	8.611	30.786	30.500
October	7.000	.....	6.898	.....	30.716	.....
November	7.042	.....	6.945	.....	30.500	.....
December	7.513	.....	7.405	.....	30.500	.....
Year	6.853	.....	6.777	.....	31.359	.....

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.300	16.676	10.130	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug	8.730	8.360	8.560	8.190	51.587	54.000
Sept	8.990	8.136	8.820	7.966	52.095	54.000
Oct.	9.829	.....	9.659	.....	54.159	.....
Nov	11.592	.....	11.422	.....	56.023	.....
Dec.	10.665	.....	10.495	.....	55.842	.....
Year	12.804	.....	12.634	.....	72.071	.....

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic†		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	46.40	19.58	42.24	19.53	48.58
October	24.61	.....	21.26	.....	21.51	.....
November	30.07	.....	28.18	.....	26.55	.....
December	35.16	.....	30.95	.....	30.79	.....
Year	$23.88	.....	$20.98	.....	$21.15	.....

‡ As reported by W. P. Snyder & Co.

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